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Contribution Number 2

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CTD Data from the Gulf of Cadiz Expedition: R/V *Oceanus* Cruise 202

by
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ABSTRACT

A total of 148 conductivity-temperature-depth (CTD) casts were made from R/V *Oceanus* during the Gulf of Cadiz Expedition, 4–28 September 1988. The regions studied included Ampere Seamount, the area around Cape St. Vincent, Portugal, and the Gulf of Cadiz west of the Strait of Gibraltar. This report describes the instrumentation used, discusses data acquisition and processing methods, and presents the processed CTD data.

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1. INTRODUCTION

This report is the reference and data summary for conductivity-temperature-depth (CTD) measurements taken during R/V *Oceanus* Cruise 202, the Gulf of Cadiz Expedition, 4–28 September 1988. The objectives of this expedition were to observe the vortices shed in the wake of Ampere Seamount, to survey eddies (Meddies) formed by the Mediterranean outflow near Cape St. Vincent, Portugal, and to study the structure and dynamics of the outflow plume west of the Strait of Gibraltar. The cruise consisted of two legs: leg 1, from 4–19 September 1988, corresponded to leg IV of *Oceanus* voyage 202; leg 2, from 21–28 September 1988, corresponded to Leg V. In addition to taking CTD stations, XCPs, XBTs, XSVs, and XDPs were deployed during the cruise. During the Ampere Seamount component of the expedition, a radar transponder was moored and four drifting buoys were tracked. The Gulf of Cadiz Expedition is described in detail in a separate report (Kennelly et al., 1989).

The operational areas are shown in Figure 1. The sampling pattern executed in the Meddy region, approximately delineated by the box in Figure 1, is shown in Figure 2.

The CTD stations are shown in Figures 3–8. CTD station 1 (Figure 3) was a test cast made shortly after leaving Funchal, Madeira. Stations 2–7 (Figure 4) were taken during the Ampere Seamount component of the experiment. After the radar transponder was moored on top of the seamount, CTD station 2 was taken due east of it in water deeper than 2000 m. Following XCP survey 1, CTD station 3 was taken in the center of the XCP survey pattern. Station 4 was taken immediately after the completion of XCP survey 2 at the north corner of the survey pattern. Following the recovery of one of the drifters, three additional CTD stations (5, 6, and 7) were taken at the west, south, and east ends of XCP survey 2.

CTD stations 8–41 (Figure 5) were taken during the Meddy component and correspond to lines 4, 8, 17, and 19 in Figure 2. A Meddy was identified in the data taken near CTD station 25, and the ship returned to that location. CTD station 42 was taken west of the Meddy (Figure 6). Stations 43 and 44 were taken at the Meddy's center and eastern edge, respectively, and station 45 was taken 9 n.mi. south of the Meddy's center. An XCP/XBT/XSV star pattern was then executed through the Meddy. Two additional CTD stations (47 and 48) were taken after completing leg 3 of the star pattern to sample the Meddy's core further. One final CTD station (49) was taken at the site of a Portuguese current meter mooring (Figure 5 near line 4).

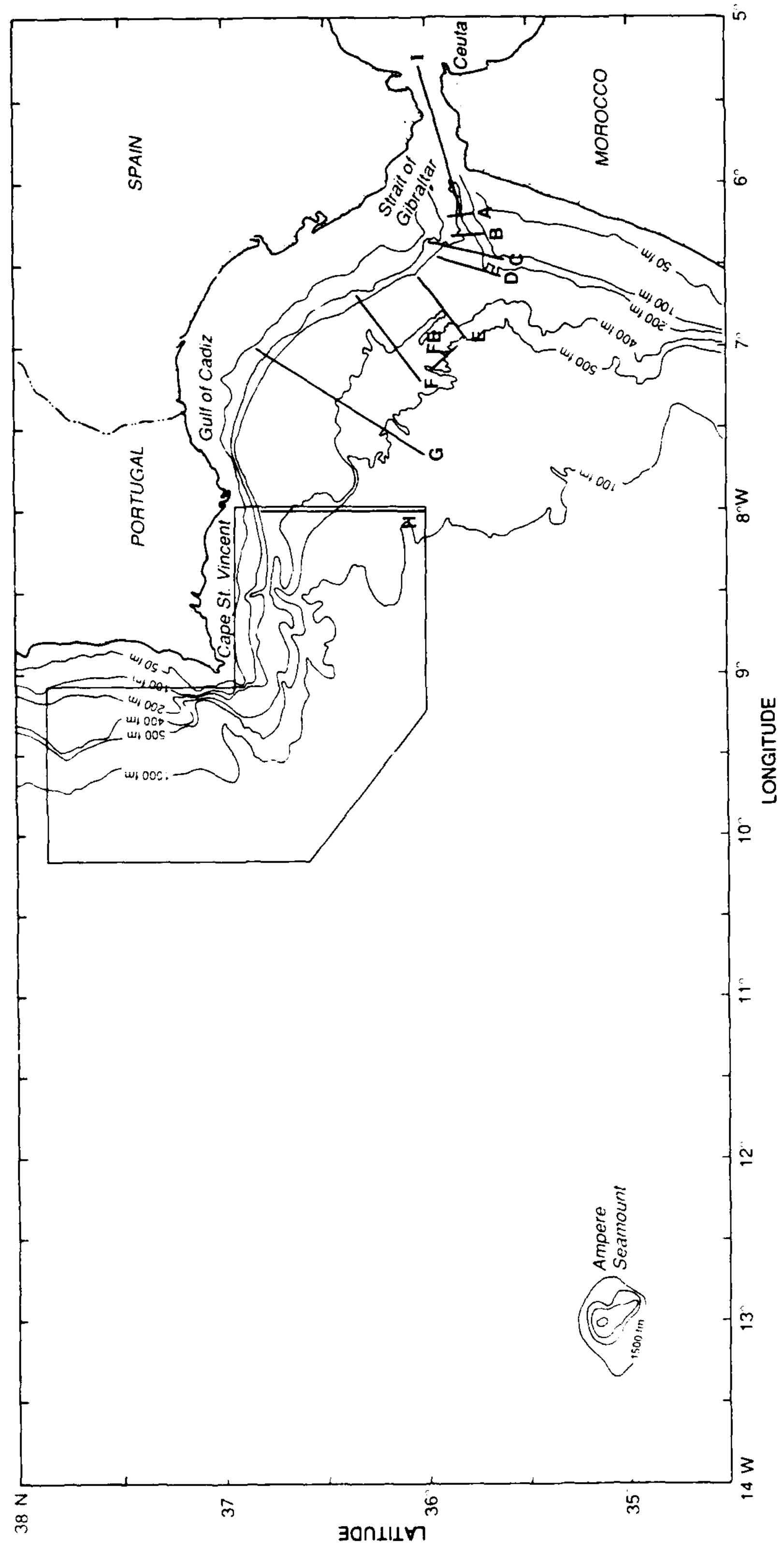


Figure 1. Operational areas for R/V Oceanus Cruise 202.

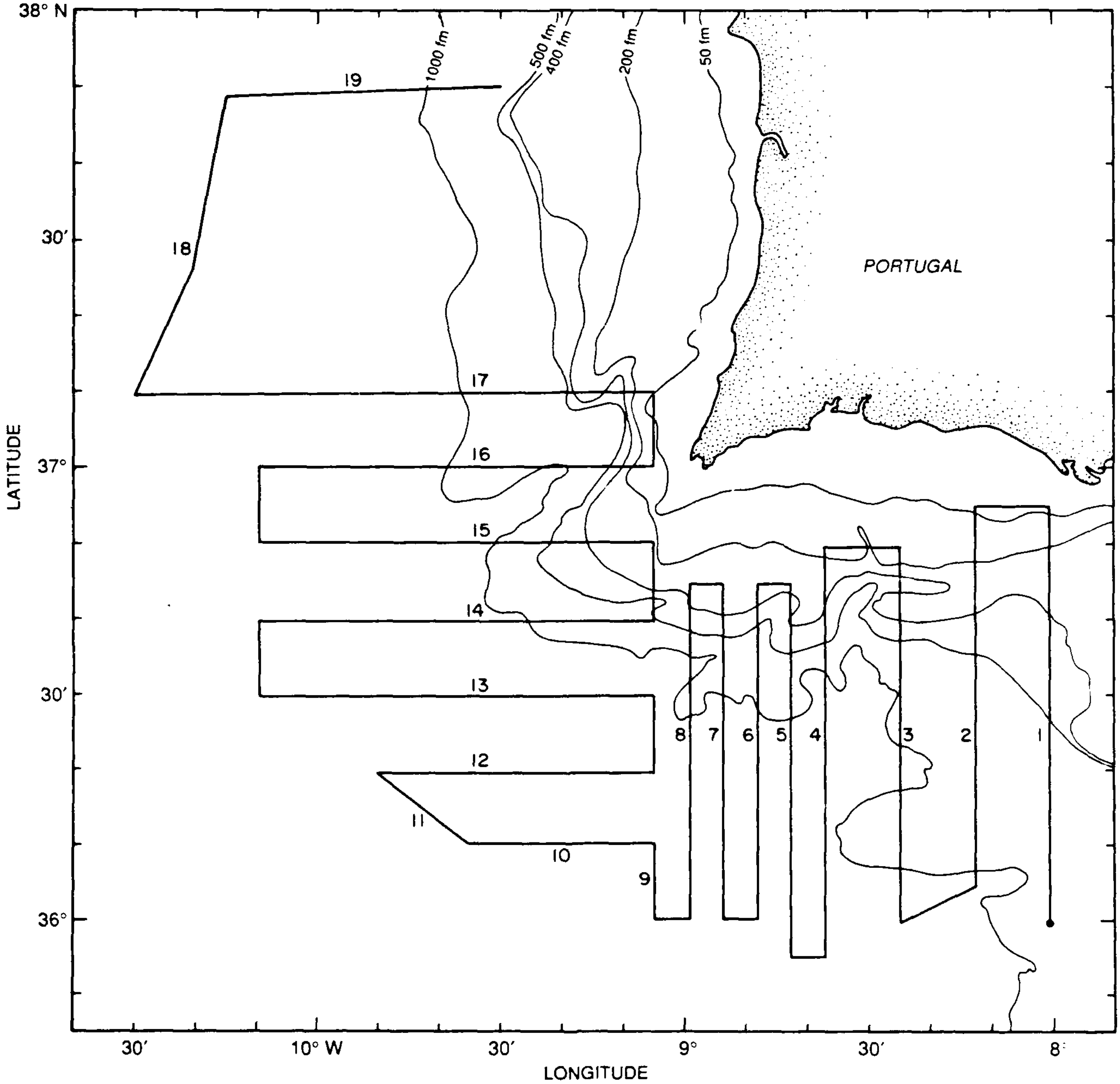


Figure 2. Survey pattern for Meddy component.

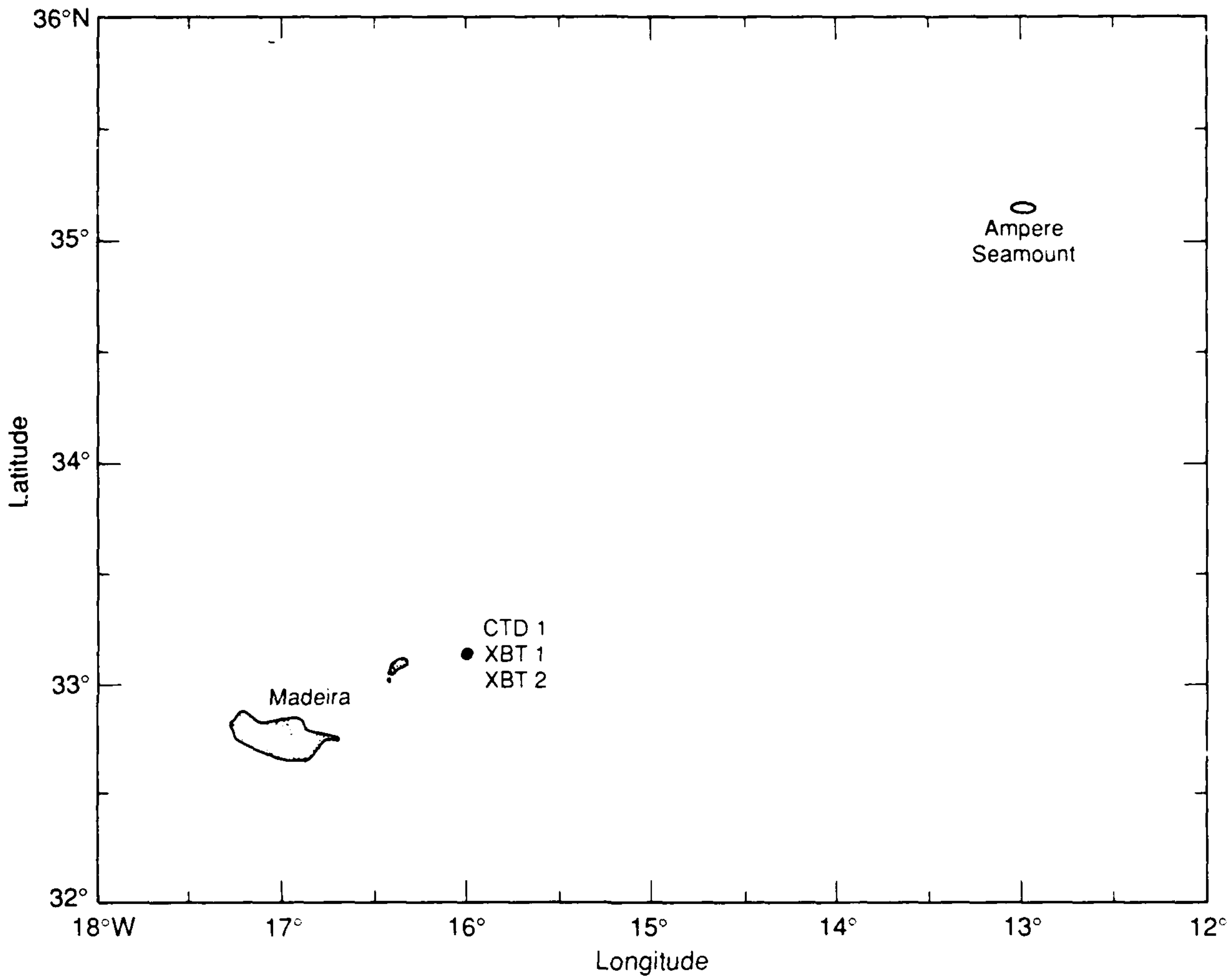


Figure 3. Test station locations.

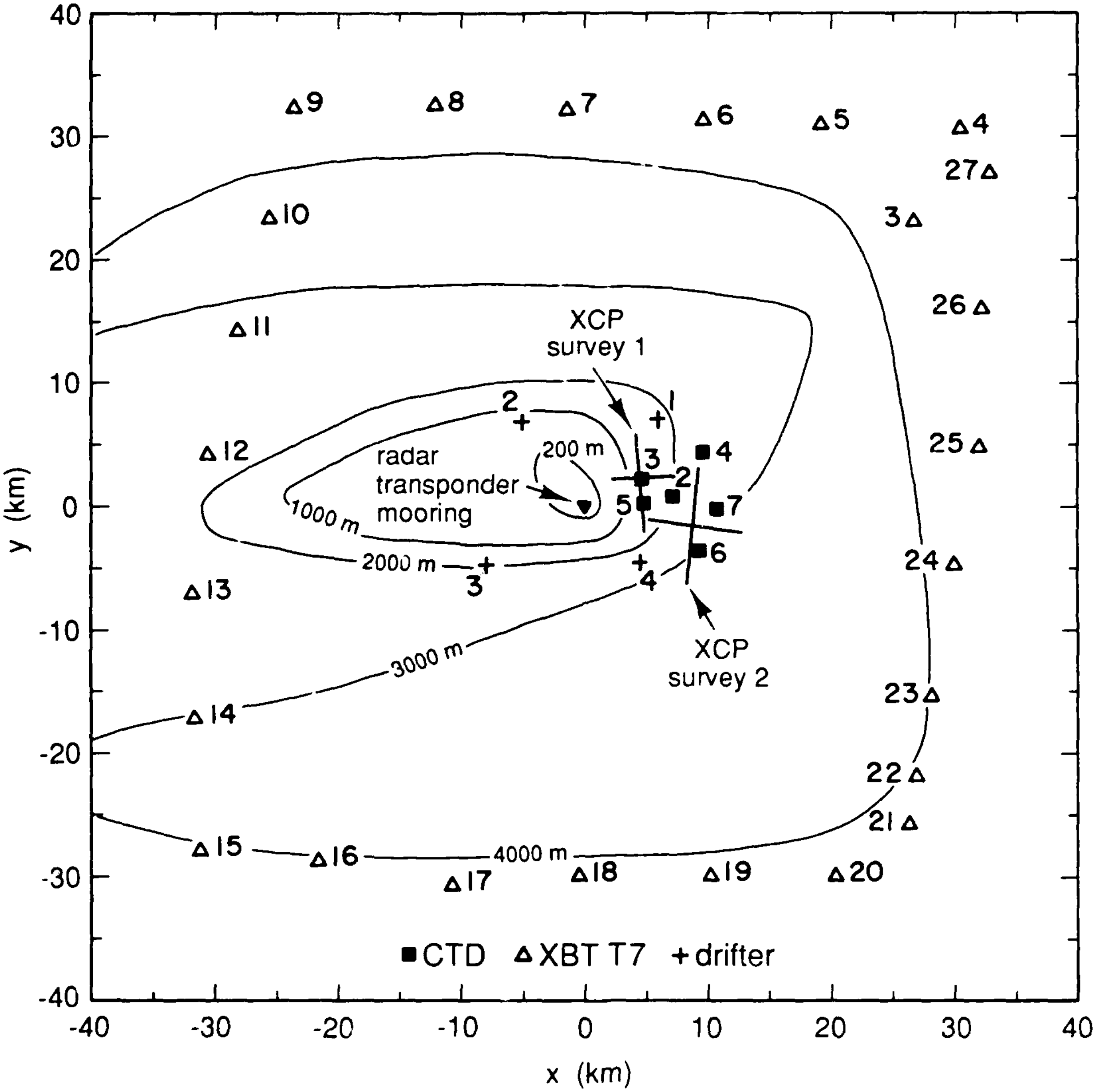


Figure 4. XCP survey patterns and locations of XBT drops, CTD stations, and initial drifter deployments for Ampere Seamount component.

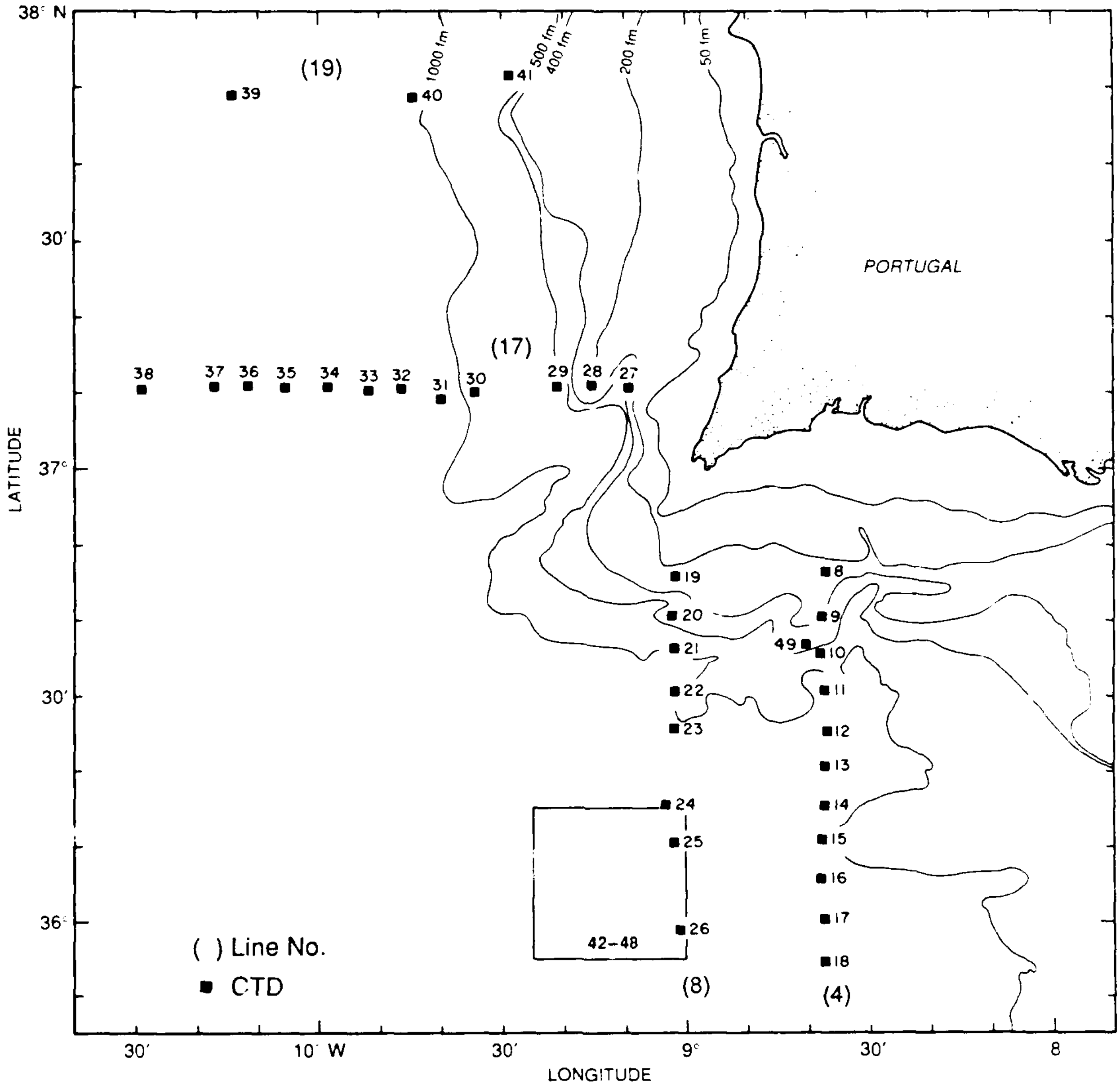


Figure 5. Locations of CTD stations during Meddy component.

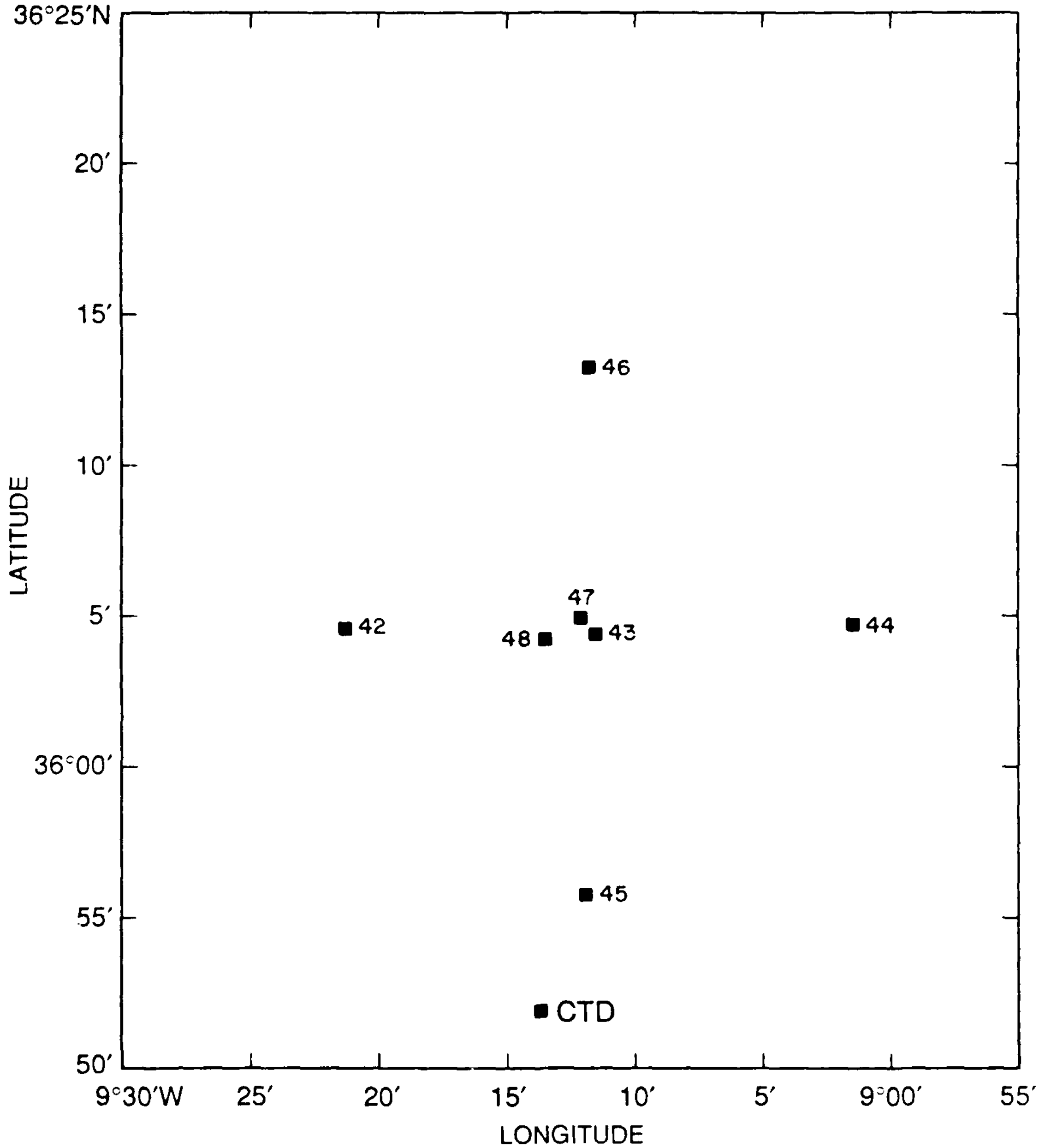


Figure 6. *Locations of CTD stations around Meddy.*

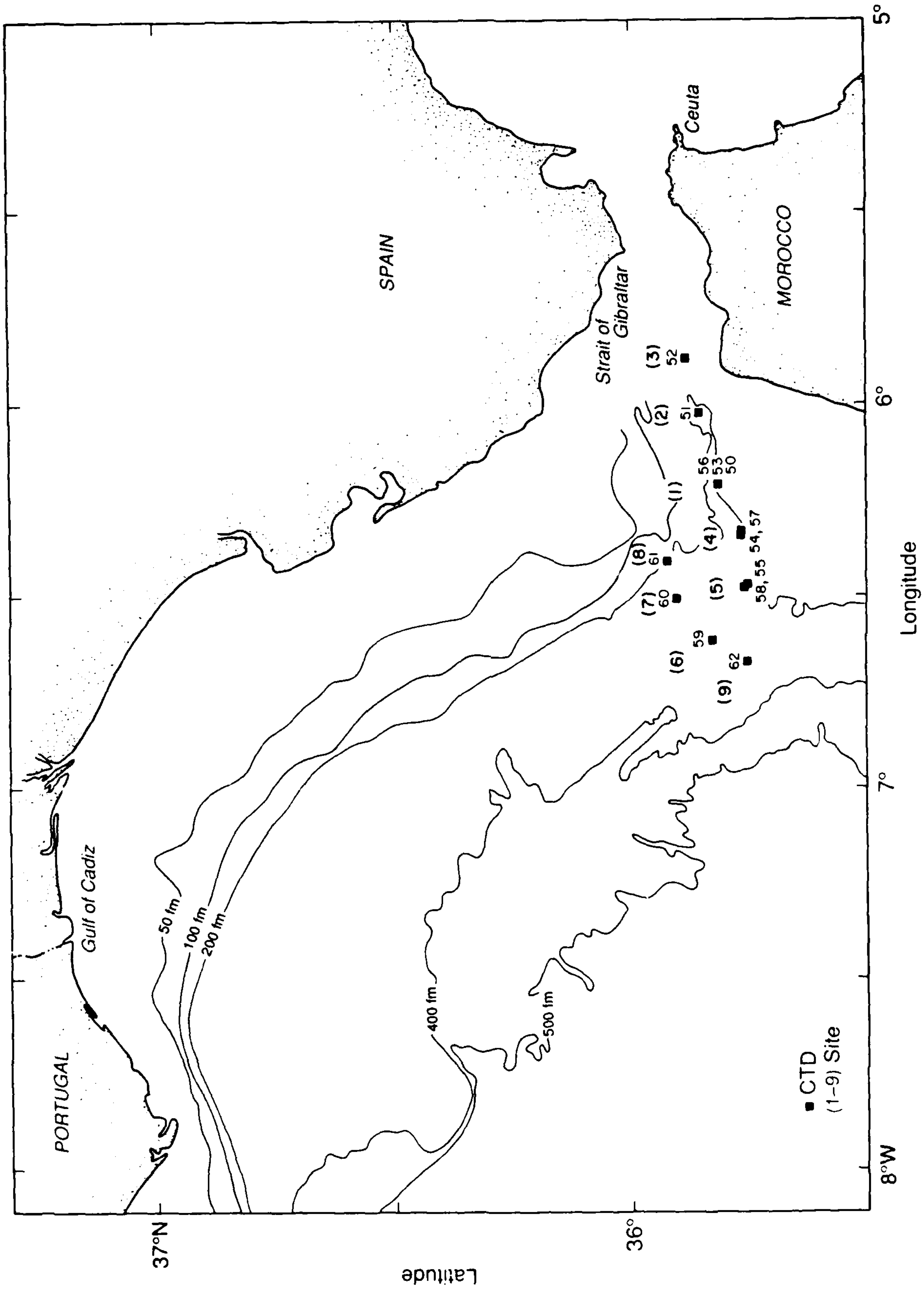


Figure 7. Locations of CTD station at sites 1–9.

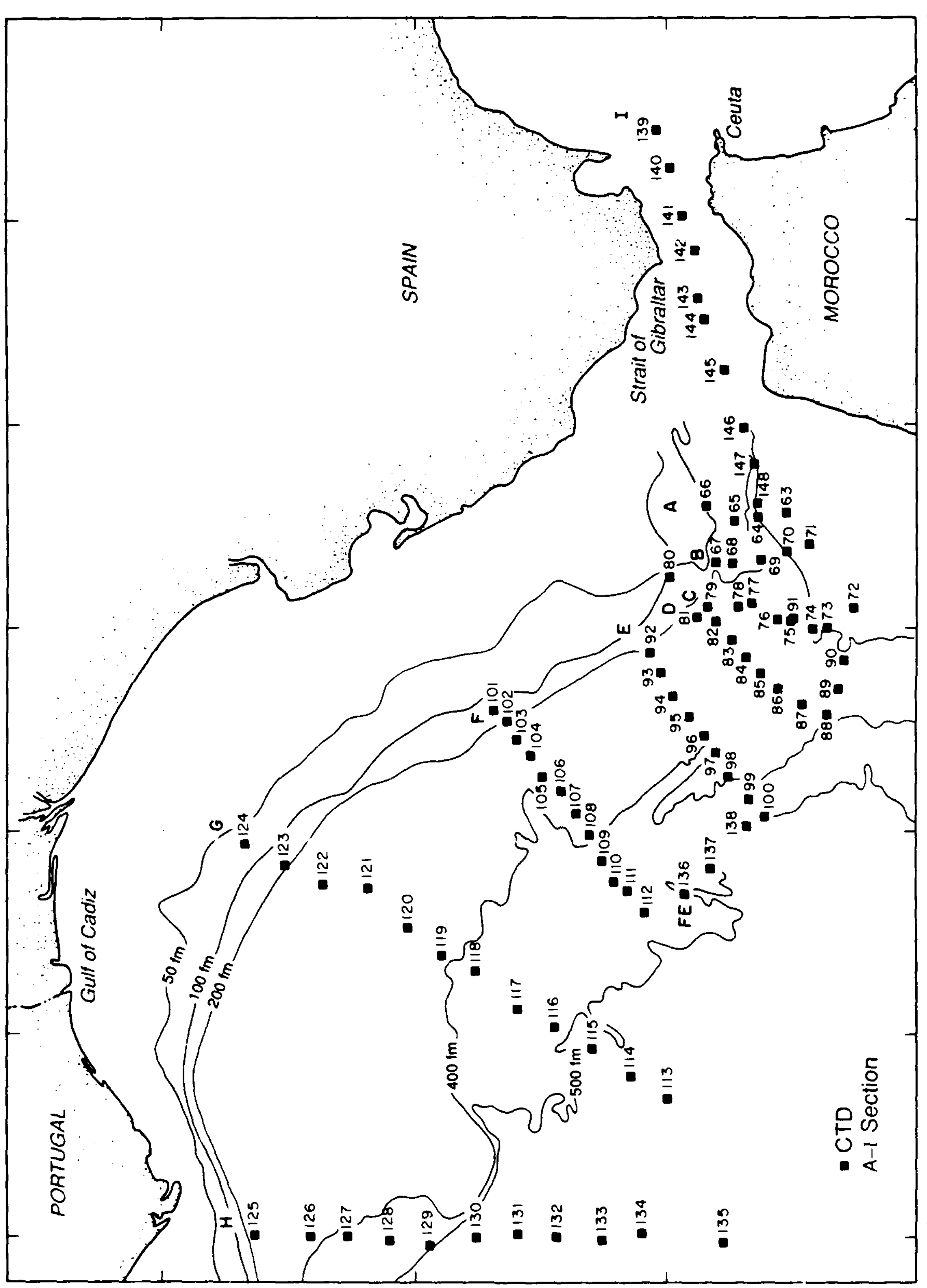


Figure 8. Locations of CTD stations along sections.

CTD stations 50–148 (Figures 7 and 8) were taken during the outflow component of the expedition. Stations 50–62 were at nine sites selected to study the temporal and spatial variability of the Mediterranean outflow. Sections A–I (CTD stations 63–148) were then completed to characterize the outflow.

The locations and times of the CTD stations are listed in Appendix A.

2. INSTRUMENTATION

A Sea-Bird Electronics (SBE) Model 9 underwater CTD unit, S/N 1, was used for profiling conductivity and temperature versus pressure. Pressure was measured with a Paroscientific Digiquartz pressure sensor (model 76KB-036, S/N 18377). The pressure range of this sensor is 0 to 6000 psi. Temperature was measured by dual temperature sensors (model SBE-3-01F, S/N 574, primary, and S/N 575, secondary; F denotes fast response). Conductivity was measured by dual conductivity sensors (model SBE-4-01, S/N 166, primary, and S/N 179, secondary). This unit was equipped with a submersible pump (model SBE-5-01, S/N 1). The pump increased the flushing speed of water through both conductivity sensors to improve their dynamic response.

A 12-kHz pinger was attached to the frame of the underwater unit and used for casts going to the bottom. Ninety-nine pounds of ballast (12 stainless steel bars) were attached to the frame of the CTD.

The underwater unit was modified by SBE shortly before the cruise to change the order of the data variables to match SBE's software. Our unit was one of the first manufactured, and before this cruise we had used our own software.

The CTD system's configuration is shown in Figure 9. The CTD data-acquisition computer was a COMPAQ Deskpro 286 personal computer (Model 40, S/N 4809AM3B1351). The Model 40 denotes that this computer has a 40 Mbyte internal hard disk drive (the c: drive). This computer has two 5-1/4-in. floppy disk drives, one with 1.2 Mbyte (a: drive) and one with 360 Kbyte (b: drive). A NEC Multisync II monitor was used with the computer. Boards installed in the computer included a VEGA brand enhanced graphics adapter (EGA) board, a National Instruments GPIB-PC-IIA board, and an Intel 80287 math coprocessor (8 MHz). An Epson FX86e dot matrix printer was used with the system for screen dumps.

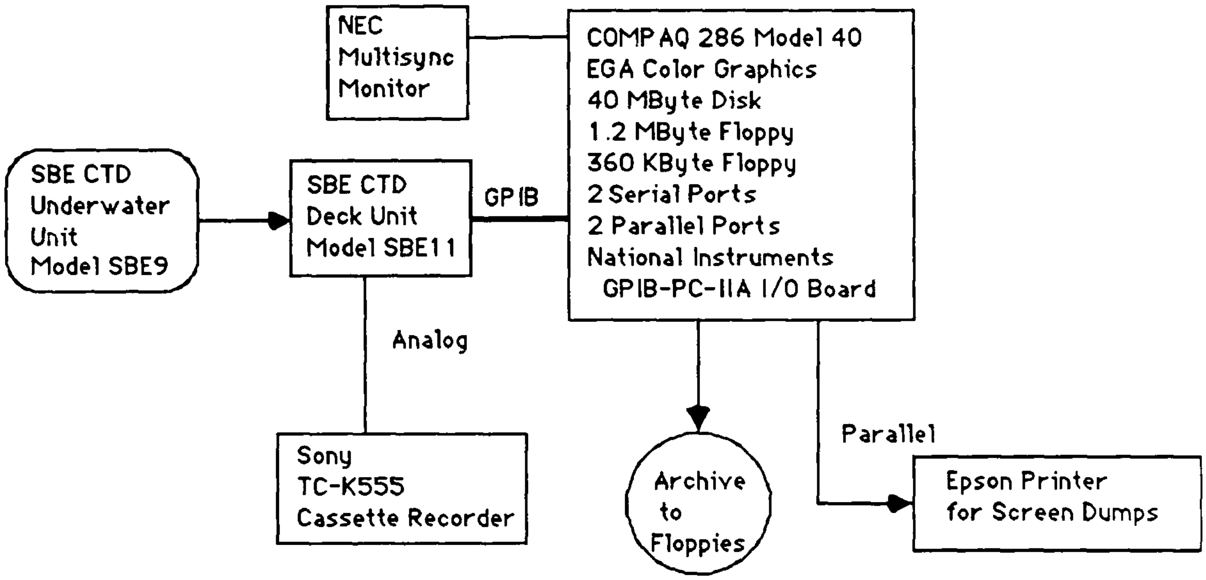


Figure 9. Configuration of CTD acquisition system.

The Model SBE 11 (S/N 6) deck unit was connected to the COMPAQ computer via a GPIB (IEEE-488) interface. A Sony TC-K555 stereo cassette deck (S/N 809809) was also connected to the deck unit and used to store the raw CTD data on analog tape.

Approximately 9000 m of Rochester Corporation three-conductor cable (code #I30030022MB00) was spooled onto the Markey Desh5 dc electric winch onboard R/V *Oceanus* for use as CTD cable. Only two of the three #20 AWG 7/0.0126-in. copper conductors were usable; the other was shorted to the armor about 6000 m into the spool. Only one of the two "good" conductors was used during the first 31 CTD casts. The cable was reterminated, and both conductors were operated in parallel for casts 32–148.

Standard stainless steel termination cups from UW Ocean Technical Services were used during the cruise. The mechanical link used to attach the cable to the CTD unit was a Cerrabend alloy. Individual electrical conductors were soldered, insulated from seawater, and attached to a two-pin SeaCon connector to mate with the Sea-Bird CTD bulkhead connector. Normally, the University of Washington conducts static load tests on the terminations; however, these tests were not done for this cruise.

No two-block catcher was used during this cruise.

In all, 148 CTD casts were made. The first cast went to a depth of 2500 m. All others were either to the bottom or to approximately 2000 m.

3. PRE-CRUISE TESTING AND CALIBRATION

3.1 Pressure Sensor

Before the cruise, a deadweight pressure test was performed on the pressure sensor (S/N 18377) using a Mansfield and Green Type 10-10525 hydraulic deadweight tester (S/N 662-24). This test was done to check the functionality of the pressure sensor and was not intended as a calibration. Three dead weights were used to test the pressure transducer. The pressure indicated by the CTD closely matched the dead weight applied, assuring us that the pressure sensor was functioning satisfactorily.

3.2 Temperature and Conductivity Sensors

All primary, secondary, and backup temperature and conductivity sensors were calibrated before the cruise at the Northwest Regional Calibration Center (NRCC). The temperature sensors calibrated were S/Ns 563, 574, and 575. The conductivity sensors calibrated were S/Ns 158, 166, and 179. The pre-cruise calibration sheets are shown in Appendix B.

4. DATA ACQUISITION

4.1 Data from SBE Underwater Unit

Seasoft version 3.0, dated 23 May 1988 and written by John Backes at SBE, was used to acquire the CTD data. The underwater CTD took 24 scans per second. The software in the deck unit (the SEACON program which alters the SEASOFT.CFG file) was set to average these 24 scans for an effective sampling rate of once per second. These averaged data were archived on the COMPAQ's hard disk. After the cast, the data files were copied from the hard disk to floppy disk. As a backup, raw data (not averaged in the deck unit) were recorded on cassette tape. Data were acquired on the downcast only.

Temperature, conductivity, and salinity profiles were plotted on the NEC monitor in real time. Following each station, three additional plots were produced: plot 1 was of temperature, salinity, density, and sound velocity from 0 to 500 dbar; plot 2 had the same variables as plot 1 but a scale from 0 to 2500 dbar; plot 3 was of temperature versus salinity.

Winch lowering speeds during a CTD station were 30 m min^{-1} from the surface to approximately 300 m and 60 m min^{-1} to approximately 800 m, then increasing to 90 m min^{-1} to terminal depth. The winch operator was asked to keep the tension above 250 lb. The CTD was raised at a rate of 90 m min^{-1}.

During CTD station 30, the acquisition program crashed while the underwater unit was at 1200 m. The program crashed again (twice) during CTD station 32. When the computer did not get data from the GPIB for >30 s, it halted the program and erased the screen. This happened several times during the casts. The acceptable delay was increased to 100 s, which helped. The cable was reterminated using both "good" conductors, this time in parallel. (The connection to the slip rings allowed both conductors to be used.) The performance after these changes was little better. Next, the voltage threshold in the deck unit was checked. It was 2.79 Vdc, whereas the manual indicated it should be 2 Vdc. The voltage threshold was set to 2.0 Vdc, and the pulse duration was shortened by 10–20 μs from its previous value of about 100 μs. The combination seemed to cure the problem, and the CTD could then be run at any speed without error. Unfortunately, when the test clips on the BNC cable to TP1 and GND were removed, the error light on the deck unit lit again regularly. It was decided to leave the clips attached, coil the cable into a loop, and secure it inside the box. The CTD continued to perform well after the fix, which was accomplished during CTD station 33.

4.2 Water Sample Data

Water samples were taken during many of the CTD casts for comparison with the salinities calculated by the CTD underwater unit. Samples were taken by attaching a single 1.5-liter Niskin bottle to the electromechanical wire supporting the Sea-Bird CTD underwater unit. The bottle was attached 2 m above the sensors on the CTD. A brass "messenger" was attached to the electromechanical wire and sent down to trip the Niskin bottle. Samples were taken either at or close to the terminal depth of the CTD cast. In areas with large vertical temperature and/or conductivity gradients at terminal depth, the sampling depth was adjusted during the messenger's fall time (200 m min^{-1}) to remain constant within several meters. Later in the cruise, the CTD unit was raised to a depth with a smaller gradient for better calibrations between bottle sample salinity and sensor salinity.

Marker files, Seasoft version 3.0 CTD###.MKR files, were created on the COMPAQ at the beginning and end of the Niskin bottle soak time for later comparison with the values computed by the Guildline Autosal during the cruise. Marker files include time, date, pressure, temperature, salinity, density, sound velocity, and scan number. Some marker files were lost when the program was terminated abnormally.

5. AT-SEA DATA PROCESSING

After each CTD station, the data were averaged into 10-dbar bins, using the Seasoft version 3.0 BINAVG program. Tables of these averages were printed and used to produce contoured sections of temperature, salinity, and potential density (σ_θ).

6. POST-CRUISE CALIBRATION

Post-cruise calibrations were performed by NRCC on the primary and secondary temperature sensors (S/N 574 and S/N 575) and conductivity sensors (S/N 166 and S/N 179). Because the backup sensors (temperature S/N 563 and conductivity S/N 179) had not been used on the cruise, they were not included in the post-cruise calibration. The post-cruise calibration sheets can be found in Appendix C.

7. POST-CRUISE DATA PROCESSING

7.1 Water Sample Data

Individual water samples were collected from the Niskin bottle using glass citrate of magnesia bottles supplied by the Physical and Chemical Oceanographic Data Facility (PACODF) at Scripps. The bottle and seal were flushed twice before drawing the final sample. Replicate samples were taken for CTD stations 50–148. A Guildline Autosal (Model 8400A, S/N 48266) was used to determine the conductivity ratios of the water samples collected. The Autosal was also supplied by PACODF for use on R/V *Oceanus*. Its stated accuracy is ±0.002 psu. The samples were stored for at least 24 hours in the laboratory next to the Autosal to stabilize their temperature. The Autosal was calibrated using standard Wormley seawater during the first few days of the cruise after the bath had initially stabilized. Six separate batches were run on the Autosal (Table I). The Autosal was also calibrated with standard Wormley seawater before runs 4–6.

Table I. Autosal runs, Oceanus *Cruise 202.*

Run No.	Date of Run	Sample No.
1	9/11/88	001-018
2	9/13/88	019-026
3	9/22/88	027-049
4	9/24/88	050-092
5	9/25/88	093-116
6	9/27/88	122-148

The Autosal standby number was 246174 for all runs. Normal cycling of both heater lamps was noted during all runs. Individual water samples were shaken vigorously to remove salinity gradients within the bottle. The Autosal conductivity cell was flushed three times with water from each individual sample bottle before conductivity ratios were noted. Two separate conductivity ratios were obtained for each sample. The ratios always differed by less than 0.00005 units and typically by 0.00002 units. The two conductivity ratios for each sample were averaged for computing salinity.

Wormley water batch number P108 was used for all Autosal standardizations. The K_{15} value was 0.99980, and the chlorinity 19.371. The raw salinity of this water was calculated to be 34.994 psu, using the IEEE algorithm (Lewis, 1980). Two vials of this water were retained as check samples. Kathy Krogslund of the University of Washington Oceanography Chemistry Laboratory ran them on another Guildline Autosal, and confirmed the salinity of the Wormley water to be 34.994 psu. Averaged conductivity ratios for each water sample, determined with the Guildline Autosal, were used to correct the raw salinity values.

An offset was found between the standard seawater values and the salinity values determined with the Autosal for runs 4, 5, and 6. The formula (standard water salinity initial value in psu – 34.994 psu) was used to determine the offset for each run. The drift throughout each individual sample run was calculated also. The drift per sample was found using the formula [(standard water salinity final value in psu) – (standard water salinity initial value in psu)] / (number of samples + standards – 1). These values are summarized in Table II.

Table II. Salinometer run information.

Run No.	CTD Station	No. of Samples	Std Water Initial Salinity (psu)	Std Water Final Salinity (psu)	Offset Per Run	Drift Per Sample
4	50-92	24	35.0216	35.0276	0.02760	0.000240
5	93-116	19	35.0198	35.0277	0.02580	0.000395
6	122-148	13	35.0161	35.0229	0.02210	0.000486

The replicate salinity samples from the Niskin bottle for stations 50–148 were logged and stored in the main laboratory aboard R/V *Oceanus* for transport to the Woods Hole Oceanographic Institution. Marv Stalcup at WHOI analyzed the replicates using another Guildline Autosal.

7.2 Comparison of Salinities

Comparison of the salinity values determined with the *Oceanus* Autosal and the replicate values determined with the WHOI Autosal showed a mean difference of –0.0003 psu with a standard deviation of 0.0084. Five of the 55 samples collected on casts 50–148 were not used in the calculation because of large differences between the Sea-Bird and Autosal measurements. These differences resulted from sampling in an area with high vertical gradients.

An average difference of –0.0089 psu with a standard deviation of 0.0096 was found between the Autosal seawater salinities computed on R/V *Oceanus* and the Sea-Bird salinities computed using the Seasoft version 3.0 marker file. An average difference of –0.0092 psu with a standard deviation of 0.012 was found between the Autosal seawater salinities measured at WHOI and the Sea-Bird salinities computed using the Seasoft version 3.0 marker file. These results are summarized in Table III.

During and after the cruise there was concern about the difference between the Autosal and Sea-Bird salinities. John Backes of SBE looked into the residual difference after initial Autosal correction factors were applied, and found that the compressibility of the conductivity cell needed to be compensated for in the software. SBE Application Note No. 10, dtd October 1988, was written to document the updated version of Seasoft, now version 3.2, which automatically implements a compression compensation equation.

Table III. Sea-Bird CTD salinities (version 3.0 software) versus corrected Autosal salinities.

	ΔS_1 (SB-SC) (psu)	ΔS_2 (SB-WA) (psu)	ΔS_3 ($\Delta S_2 - \Delta S_1$) (psu)
Average	−0.0089	−0.0092	−0.0003
Standard Deviation	0.0096	0.012	0.0084

SB = Sea-Bird salinity (version 3.0)
SC = Ship's corrected salinity
WA = WHOI corrected salinity

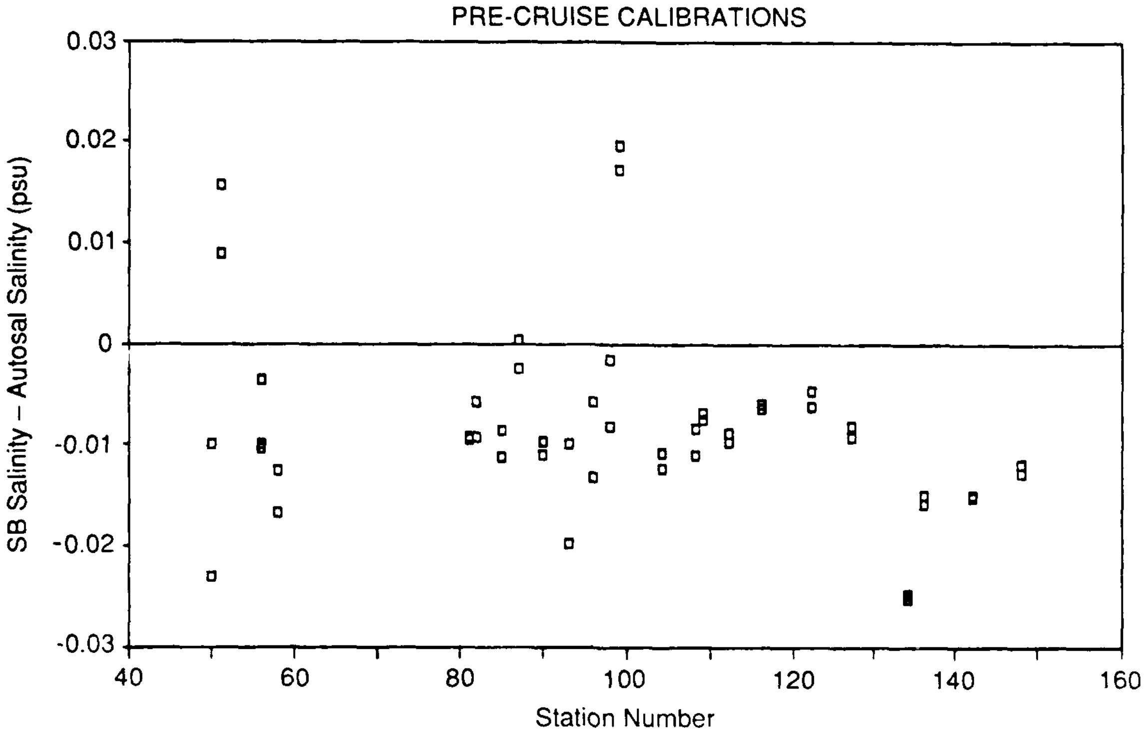
To test this new software, Backes and Tom Lehman ran the bin averaging routines in both Seasoft 3.0 and Seasoft 3.2 using the same data set for CTD station 12. They found that the new software with its pressure-dependent term changed the computed salinity at the bottle sampling depth, 2010 dbar, from 35.189 psu to 35.197 psu, a change of 0.008.

The increase in salinity when using Seasoft version 3.2 was in the right direction to offset the difference noted between the Autosal and SBE salinities. The next step was to compute salinities with version 3.2 and compare them with the corrected Autosal values. This was done for a subset of the data, 24 stations. Both pre- and post-cruise calibrations were tried at this stage. The results are summarized in Table IV. Graphs of the differences are shown in Figure 10. The Sea-Bird salinities computed when using the post-cruise calibrations agree well (within the stated accuracy of ±0.002 psu for the Guildline Autosal model 8400A) with the corrected Autosal salinities (Figure 10b) and were used in all subsequent reprocessing.

Table IV. Sea-Bird CTD salinities (version 3.2 software) versus corrected Autosal salinities.

	(SB_{pre}–SC) (psu)	(SB_{post}–SC) (psu)
Average	−0.0083	−0.0019
Standard Deviation	0.0088	0.0089

SB = Sea-Bird salinity (version 3.2)
SC = Ships corrected salinity



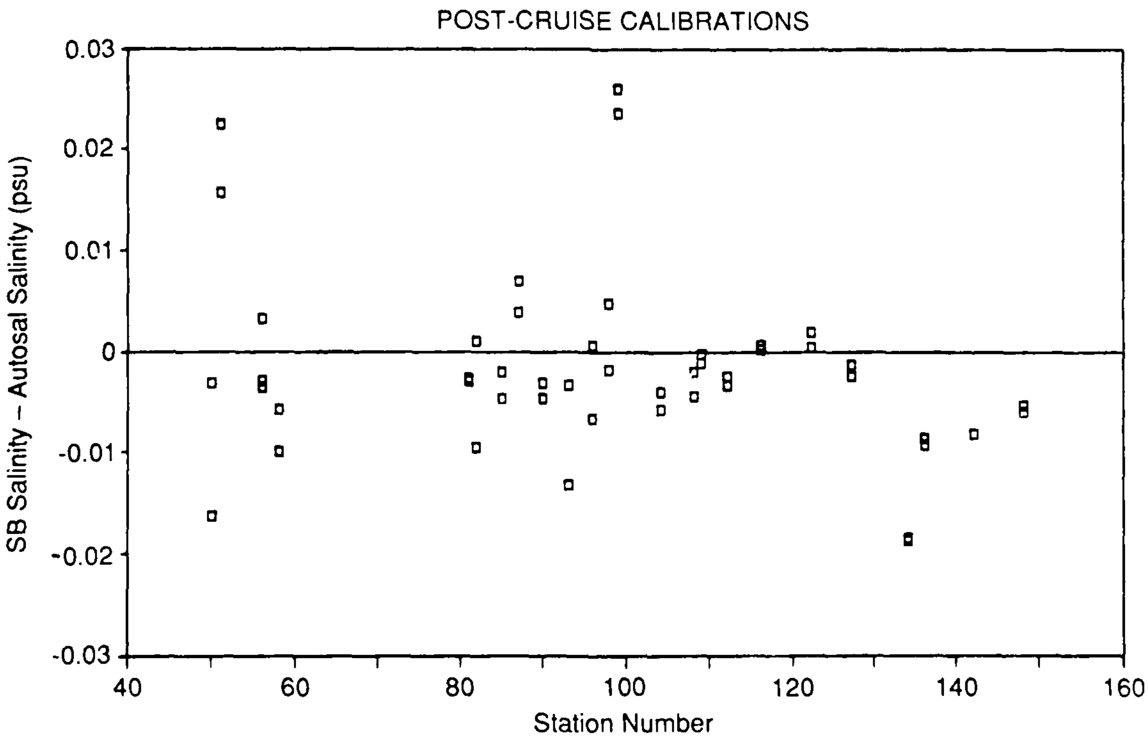


Figure 10. Difference between SBE salinity and corrected Autosal salinity versus station number.

7.3 Final Processing

All the CTD data from *Oceanus* Cruise 202 were reprocessed using the post-cruise sensor calibrations and version 3.2 of Seasoft, producing 2-dbar averages of temperature and conductivity. There is one file for each CTD station. The files of pressure, temperature, and conductivity were transferred to the HP9050 computer. Salinity, potential temperature (θ_1), and density (σ_1) were calculated on the HP9050 using software routines written by Ngoc Dang at APL. The following sections outline the calculations of the derived quantities.

7.3.1 Salinity

Salinity was calculated from pressure, temperature, and conductivity after the temperature and conductivity were averaged into 2-dbar bins. The temperature and conductivity values used were from the primary sensors. The routine used to calculate salinity was based on that of Perkin and Lewis (1980).

7.3.2 Potential temperature (θ_1)

Potential temperature θ_1 denotes the temperature of water moved adiabatically to 1000 dbar. This quantity was calculated from salinity, temperature, pressure, and a reference pressure (here, 1000 dbar) using the method of Fofonoff (1977).

7.3.3 Potential density (σ_1)

The density of water moved adiabatically to 1000 dbar is the potential density σ_1. In equation form,

$$\sigma_1 = \rho\,(\,s\,,\theta_1\,,p\,=1000\,\text{dbar}\,) - 1000\,\text{kg m}^{-3},$$

where ρ is density, s is salinity, and p is pressure. The routine used to calculate σ_1 is based on the work of Millero et al. (1980).

8. DATA PRESENTATION

Graphs of the data (2-dbar averages) are presented in Appendix D. There is one plot of temperature, salinity, and potential density (σ_1) versus pressure for each CTD station.

Plots of temperature versus salinity are presented in Appendix E. They are grouped by station location: Ampere Seamount, Meddy component, CTDs in the Meddy, site CTDs, and individual sections A–I.

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APPENDIX A

Oceanus Cruise 202, CTD Log

Drop #	Date	Time	Latitude	Longitude	Method	Cast Depth (m)
			Test Cast			
1	09/04/88	16:18	33 08.27	15 59.87	LC	2466
			Ampere Seamount			
2	09/05/88	16:29	35 03.10	12 47.80	LC	1604
3	09/08/88	18:21	35 03.88	12 49.58	LC	1494
4	09/09/88	17:11	35 05.03	12 46.46	LC	1602
5	09/09/88	20:15	35 02.82	12 49.28	LC	1624
6	09/09/88	21:54	35 00.72	12 45.99	LC	1596
7	09/09/88	23:12	35 02.54	12 45.34	LC	1606
			Cape St. Vincent Region			
			(line 4)			
8	09/11/88	20:40	36 45.92	8 37.15	LC	682
9	09/11/88	21:49	36 39.99	8 37.82	LC	758
10	09/11/88	23:15	36 35.09	8 38.17	LC	1308
11	09/12/88	00:49	36 30.23	8 37.39	LC	1992
12	09/12/88	02:37	36 24.86	8 36.97	LC	2022
13	09/12/88	04:25	36 20.19	8 37.44	LC	2006
14	09/12/88	06:14	36 14.99	8 37.46	LC	2000
15	09/12/88	08:22	36 10.51	8 37.93	LC	2002
16	09/12/88	10:12	36 05.29	8 38.15	LC	1988
17	09/12/88	12:24	35 59.97	8 37.48	LC	2020
18	09/12/88	14:14	35 54.37	8 37.53	LC	2018
			(line 8)			
19	09/13/88	09:14	36 45.44	9 01.79	LC	584
20	09/13/88	10:19	36 40.19	9 02.43	LC	780
21	09/13/88	11:22	36 35.83	9 02.07	LC	2002
22	09/13/88	13:21	36 30.13	9 01.96	LC	1988
23	09/13/88	15:02	36 25.22	9 02.05	LC	1992
24	09/13/88	17:29	36 15.13	9 03.52	LC	1992
25	09/13/88	19:06	36 10.15	9 02.10	LC	1996
26	09/13/88	21:31	35 58.61	9 01.23	LC	1970

Drop #	Date	Time	Latitude	Longitude	Method	Cast Depth (m)
			(line 17)			
27	09/15/88	10:33	37 10.39	9 09.37	LC	586
28	09/15/88	11:40	37 10.72	9 15.42	LC	646
29	09/15/88	12:44	37 10.53	9 21.09	LC	884
30	09/15/88	14:36	37 09.83	9 34.59	LC	1750
31	09/15/88	16:17	37 08.90	9 40.19	LC	2014
32	09/15/88	18:06	37 10.36	9 46.58	LC	2012
33	09/15/88	22:35	37 10.14	9 51.95	LC	2004
34	09/16/88	01:17	37 10.59	9 58.67	LC	2014
35	09/16/88	03:01	37 10.57	10 05.61	LC	2006
36	09/16/88	04:45	37 10.79	10 11.69	LC	2016
37	09/16/88	06:22	37 10.76	10 17.19	LC	2024
38	09/16/88	08:32	37 10.38	10 29.00	LC	2002
			(line 19)			
39	09/16/88	14:21	37 49.39	10 14.18	LC	2014
40	09/16/88	17:56	37 49.00	9 44.63	LC	2012
41	09/16/88	20:32	37 51.86	9 28.92	LC	1052
			Meddy Survey			
42	09/17/88	13:49	36 04.55	9 21.35	LC	1614
43	09/17/88	16:02	36 04.36	9 11.56	LC	1804
44	09/17/88	17:49	36 04.68	9 01.44	LC	1622
45	09/17/88	19:53	35 55.71	9 11.92	LC	1758
46	09/18/88	00:45	36 13.26	9 11.81	LC	1810
47	09/18/88	12:05	36 04.89	9 12.12	LC	1810
48	09/18/88	13:35	36 04.20	9 13.51	LC	1798
			Portuguese Mooring Location			
49	09/18/88	20:15	36 36.43	8 40.40	LC	920

Drop #	Date	Time	Latitude	Longitude	Method	Cast Depth
			Outflow Component			
			(site 1)			
50	09/21/88	12:52	35 48.48	6 12.72	LC	396
			(site 2)			
51	09/21/88	15:14	35 51.07	6 01.42	LC	404
			(site 3)			
52	09/21/88	16:32	35 52.80	5 52.96	LC	540
			(site 1)			
53	09/21/88	18:53	35 48.89	6 12.89	LC	416
			(site 4)			
54	09/21/88	21:46	35 45.94	6 20.54	LC	430
			(site 5)			
55	09/22/88	01:32	35 45.12	6 28.37	LC	492
			(site 1)			
56	09/22/88	03:35	35 48.94	6 12.66	LC	406
			(site 4)			
57	09/22/88	05:28	35 45.89	6 19.90	LC	396
			(site 5)			
58	09/22/88	06:50	35 45.47	6 28.69	LC	476
			(site 6)			
59	09/22/88	08:33	35 49.47	6 37.07	LC	534

Drop #	Date	Time	Latitude	Longitude	Method	Cast Depth (m)
			(site 7)			
60	09/22/88	10:01	35 54.09	6 30.49	LC	450
			(site 8)			
61	09/22/88	11:24	35 55.20	6 24.68	LC	330
			(site 9)			
62	09/22/88	13:42	35 45.05	6 40.30	LC	710
			Section A			
63	09/22/88	17:15	35 45.74	6 13.13	LC	264
64	09/22/88	18:00	35 49.10	6 13.70	LC	408
65	09/22/88	18:55	35 51.93	6 14.26	LC	330
66	09/22/88	19:55	35 55.22	6 12.05	LC	220
			Section B			
67	09/22/88	21:24	35 54.13	6 20.43	LC	286
68	09/22/88	22:09	35 52.10	6 20.49	LC	240
69	09/22/88	22:33	35 48.75	6 20.02	LC	360
70	09/22/88	23:31	35 45.68	6 18.78	LC	388
71	09/23/88	00:29	35 42.96	6 17.78	LC	276
			Section C			
72	09/23/88	01:57	35 37.69	6 27.12	LC	256
73	09/23/88	03:02	35 40.88	6 30.09	LC	352
74	09/23/88	03:36	35 42.58	6 30.22	LC	350
75	09/23/88	04:21	35 45.27	6 29.03	LC	486
76	09/23/88	05:27	35 46.82	6 28.86	LC	444
77	09/23/88	06:32	35 49.87	6 26.43	LC	390
78	09/23/88	07:45	35 51.51	6 26.98	LC	494
79	09/23/88	08:55	35 55.19	6 27.01	LC	406
80	09/23/88	10:11	35 59.63	6 22.59	LC	216
			Section D			
81	09/23/88	11:08	35 56.37	6 28.52	LC	408
82	09/23/88	12:12	35 54.16	6 29.13	LC	426
83	09/23/88	13:05	35 52.26	6 31.87	LC	526
84	09/23/88	14:00	35 50.57	6 34.48	LC	532

Drop #	Date	Time	Latitude	Longitude	Method	Cast Depth (m)
			Section D (continued)			
85	09/23/88	15:23	35 48.75	6 36.77	LC	544
86	09/23/88	16:32	35 46.66	6 39.10	LC	634
87	09/23/88	17:32	35 43.80	6 41.34	LC	610
88	09/23/88	18:31	35 40.92	6 42.89	LC	734
89	09/23/88	19:31	35 39.52	6 39.12	LC	600
90	09/23/88	20:28	35 38.85	6 34.82	LC	474
			(Station C4)			
91	09/23/88	21:53	35 45.03	6 28.73	LC	492
			Section E			
92	09/24/88	00:49	36 01.92	6 33.77	LC	376
93	09/24/88	02:08	36 00.59	6 36.71	LC	514
94	09/24/88	03:30	35 59.14	6 40.19	LC	514
95	09/24/88	04:35	35 57.25	6 43.21	LC	600
96	09/24/88	05:51	35 55.50	6 46.00	LC	698
97	09/24/88	07:05	35 54.06	6 48.48	LC	764
98	09/24/88	08:21	35 52.67	6 52.08	LC	734
99	09/24/88	09:22	35 50.18	6 55.38	LC	820
100	09/24/88	10:20	35 48.25	6 57.95	LC	946
			Section F			
101	09/24/88	16:57	36 20.50	6 42.35	LC	302
102	09/24/88	17:36	36 18.93	6 43.87	LC	380
103	09/24/88	18:21	36 17.82	6 46.60	LC	580
104	09/24/88	19:26	36 16.05	6 48.95	LC	678
105	09/24/88	20:25	36 14.75	6 52.04	LC	728
106	09/24/88	21:20	36 12.51	6 54.25	LC	688
107	09/24/88	22:37	36 10.76	6 57.54	LC	740
108	09/25/88	00:19	36 09.15	7 00.67	LC	738
109	09/25/88	01:27	36 07.68	7 04.50	LC	746
110	09/25/88	02:40	36 06.23	7 07.64	LC	758
111	09/25/88	03:41	36 04.64	7 08.98	LC	778
112	09/25/88	04:46	36 02.63	7 12.12	LC	822
			Section G			
113	09/25/88	07:41	35 59.91	7 39.62	LC	1252
114	09/25/88	09:11	36 04.22	7 36.32	LC	1028
115	09/25/88	10:38	36 08.97	7 32.25	LC	1016

Drop #	Date	Time	Latitude	Longitude	Method	Cast Depth (m)
			Section G (continued)			
116	09/25/88	11:57	36 13.38	7 29.10	LC	846
117	09/25/88	13:15	36 17.74	7 26.45	LC	710
118	09/25/88	14:27	36 22.77	7 20.83	LC	806
119	09/25/88	15:32	36 26.82	7 18.49	LC	666
120	09/25/88	16:32	36 30.79	7 14.43	LC	564
121	09/25/88	17:36	36 35.56	7 08.65	LC	508
122	09/25/88	18:35	36 40.86	7 08.08	LC	486
123	09/25/88	19:36	36 45.41	7 05.15	LC	352
124	09/25/88	20:27	36 50.20	7 02.06	LC	108
			Section H			
125	09/26/88	00:42	36 49.04	7 59.81	LC	470
126	09/26/88	01:56	36 42.36	8 00.02	LC	730
127	09/26/88	02:57	36 37.99	7 59.99	LC	758
128	09/26/88	04:05	36 33.02	8 00.61	LC	776
129	09/26/88	05:06	36 28.13	8 01.31	LC	880
130	09/26/88	06:27	36 22.72	8 00.10	LC	1240
131	09/26/88	07:43	36 17.71	7 59.63	LC	1186
132	09/26/88	09:08	36 13.12	8 00.05	LC	1468
133	09/26/88	10:54	36 07.77	8 00.55	LC	1656
134	09/26/88	12:04	36 02.99	7 59.50	LC	1490
135	09/26/88	14:09	35 53.32	8 00.83	LC	1782
			Section FE			
136	09/26/88	18:52	35 57.88	7 09.42	LC	984
137	09/26/88	21:02	35 54.78	7 05.65	LC	956
138	09/26/88	22:24	35 50.03	6 59.87	LC	1006
			Section I			
139	09/27/88	07:40	36 00.94	5 16.99	LC	852
140	09/27/88	09:29	35 59.37	5 22.50	LC	924
141	09/27/88	11:24	35 57.97	5 29.55	LC	872
142	09/27/88	12:13	35 56.44	5 34.67	LC	514
143	09/27/88	13:24	35 56.14	5 41.64	LC	458
144	09/27/88	14:10	35 55.36	5 44.75	LC	256
145	09/27/88	15:33	35 52.96	5 52.16	LC	432
146	09/27/88	16:54	35 50.70	6 00.64	LC	316
147	09/27/88	18:11	35 49.51	6 05.97	LC	398
148	09/27/88	19:23	35 49.11	6 11.72	LC	404

APPENDIX B

Pre-Cruise SBE Sensor Calibration Sheets

SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

TEMPERATURE CALIBRATION DATA
CALIBRATION DATE: 5-13-88

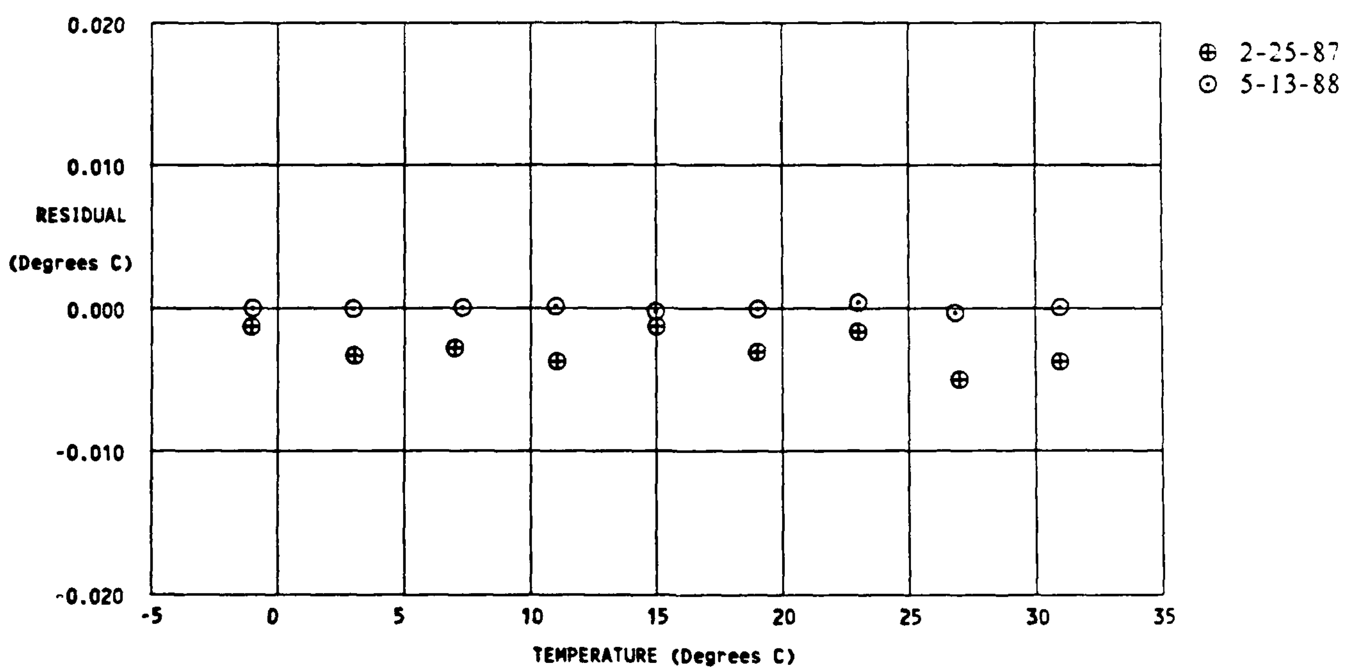
SENSOR SERIAL NUMBER = 563

a = 3.67448744e-03 b = 5.99257301e-04
c = 1.54476553e-05 d = 1.94503745e-06
f_o = 5376.61

BATH TEMP (°C)	INSTRUMENT FREQ (Hz)	INST TEMP (°C)	RESIDUAL (°C)
30.9848	10351.45	30.9849	0.00007
23.0058	8893.07	23.0062	0.00040
14.9829	7577.29	14.9827	-0.00024
7.3036	6452.80	7.3036	0.00004
-1.0032	5376.61	-1.0032	0.00000
26.8536	9577.16	26.8533	-0.00032
19.0278	8222.19	19.0278	-0.00005
10.9994	6978.00	10.9995	0.00012
2.9654	5873.13	2.9654	-0.00002

Temperature = $1/\{a + b[\ln(f_o/f)] + c[\ln^2(f_o/f)] + d[\ln^3(f_o/f)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

TEMPERATURE CALIBRATION DATA
CALIBRATION DATE: 5-13-88

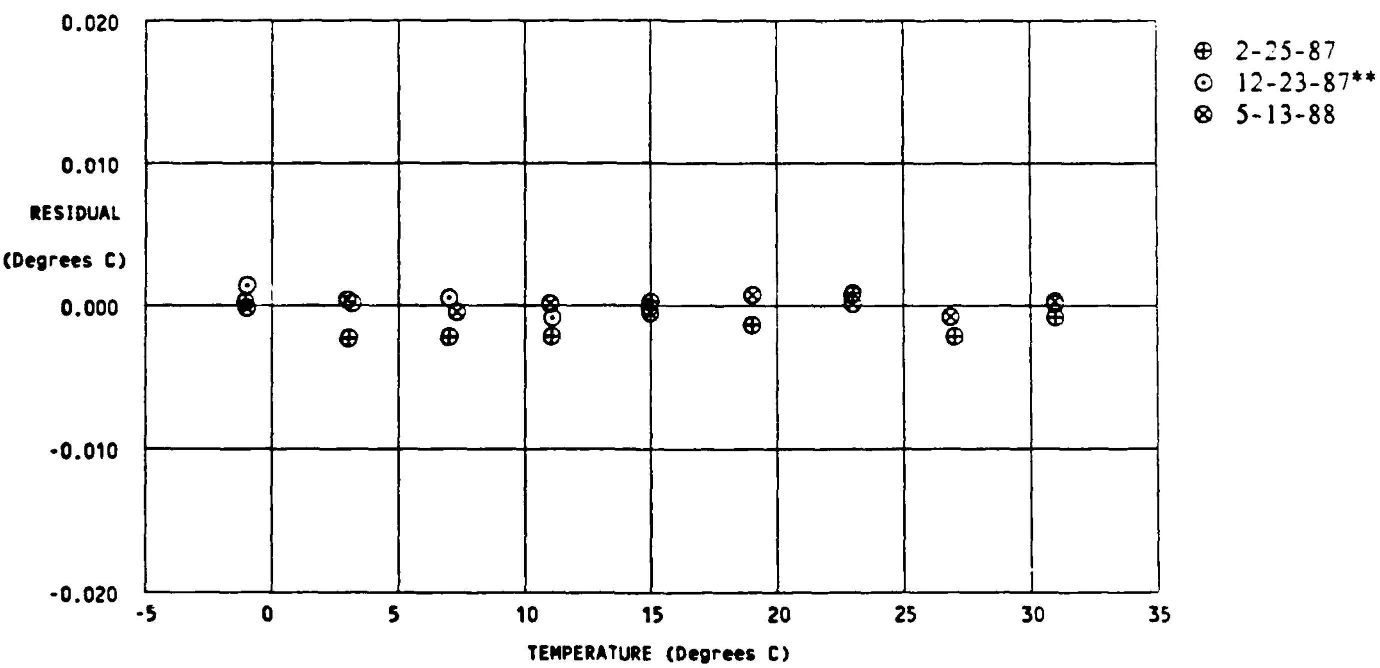
SENSOR SERIAL NUMBER = 574

a = 3.67448898e-03 b = 6.00339404e-04
c = 1.51629229e-05 d = 1.75663727e-06
f_o = 5345.91

BATH TEMP (°C)	INSTRUMENT FREQ (Hz)	INST TEMP (°C)	RESIDUAL (°C)
30.9848	10278.68	30.9851	0.00029
23.0058	8833.34	23.0060	0.00015
14.9829	7528.94	14.9824	-0.00050
7.3036	6413.69	7.3032	-0.00042
-1.0032	5345.91	-1.0033	-0.00011
26.8536	9511.30	26.8529	-0.00073
19.0278	8168.50	19.0286	0.00077
10.9994	6934.69	10.9995	0.00015
2.9654	5838.71	2.9658	0.00040

Temperature = $1/\{a + b[\ln(f_o/f)] + c[\ln^2(f_o/f)] + d[\ln^3(f_o/f)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

TEMPERATURE CALIBRATION DATA
CALIBRATION DATE: 5-13-88

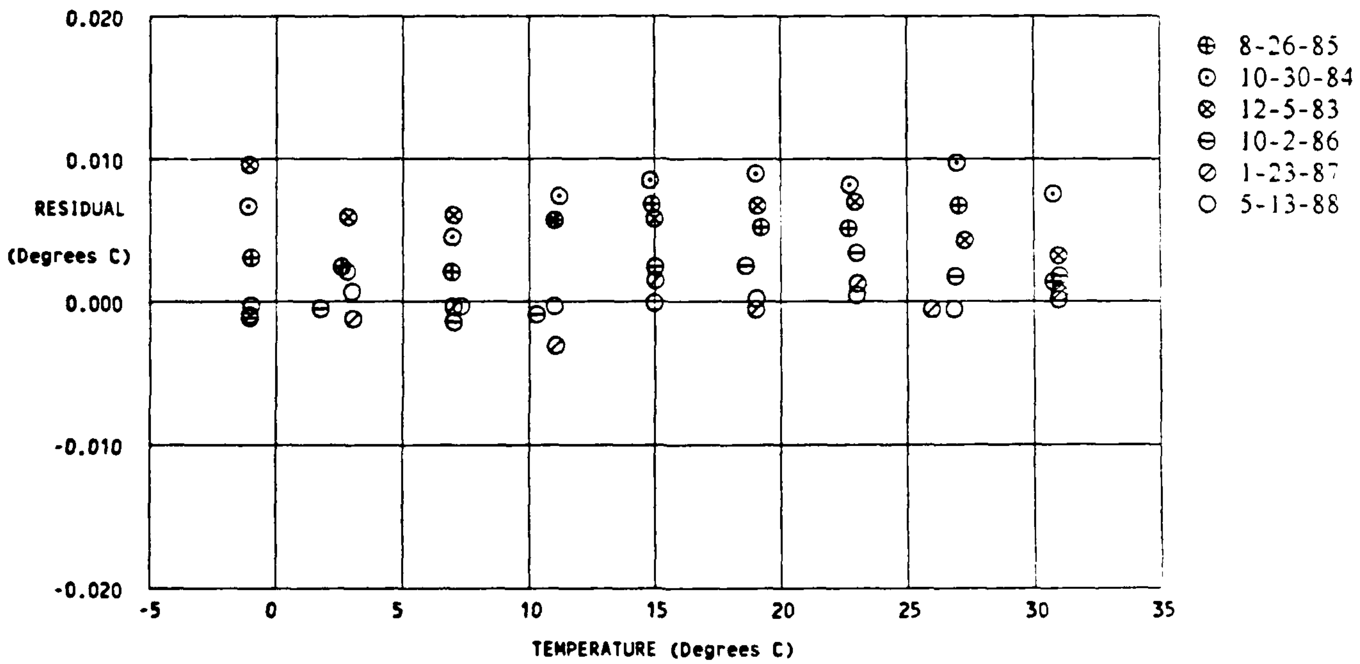
SENSOR SERIAL NUMBER = 575

a = 3.67449083e-03 b = 6.12229566e-04
c = 1.76214050e-05 d = 1.81173054e-06
f_o = 5909.91

BATH TEMP (°C)	INSTRUMENT FREQ (Hz)	INST TEMP (°C)	RESIDUAL (°C)
30.9848	11234.43	30.9849	0.00013
23.0058	9677.96	23.0063	0.00045
14.9829	8271.08	14.9828	-0.00007
7.3036	7066.04	7.3033	-0.00031
-1.0032	5909.91	-1.0035	-0.00025
26.8536	10408.34	26.8531	-0.00054
19.0278	8961.02	19.0280	0.00024
10.9994	7629.15	10.9991	-0.00032
2.9654	6443.86	2.9661	0.00067

Temperature = $1/\{a + b[\ln(f_o/f)] + c[\ln^2(f_o/f)] + d[\ln^3(f_o/f)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

CONDUCTIVITY CALIBRATION DATA
CALIBRATION DATE: 5-13-88

PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

SENSOR SERIAL NUMBER = 158

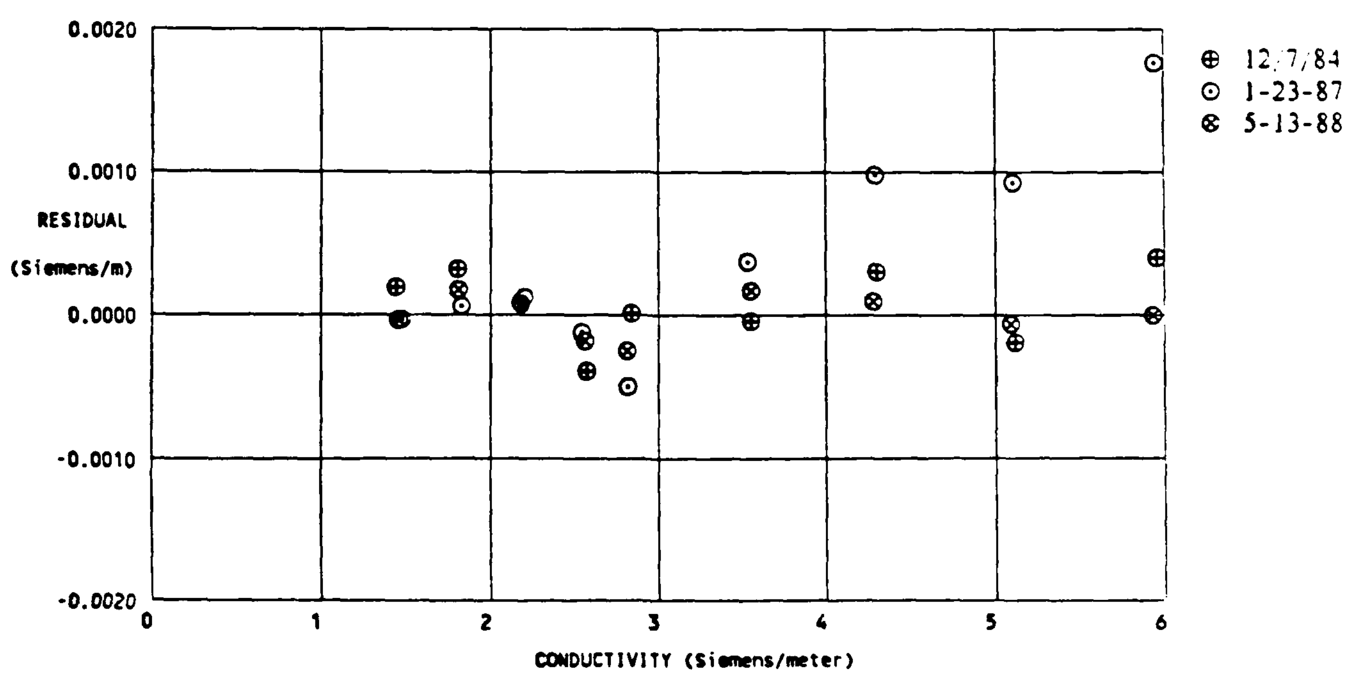
a = 5.36201949e-09 b = 6.09570353e-01
c = -1.02040952e-02 d = 3.58595395e-04
m = 7.7

BATH TEMP (°C)	BATH SAL (°/oo)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
30.9848	34.9371	5.93095	9.84404	5.93095	-0.00000
23.0058	34.9369	5.09113	9.12710	5.09107	-0.00006
14.9829	34.9373	4.28285	8.37598	4.28295	0.00010
7.3036	34.9375	3.55064	7.62946	3.55081	0.00017
-1.0032	34.9369	2.81313	6.79266	2.81288	-0.00025
26.8536	15.0019	2.56139	6.48089	2.56121	-0.00018
19.0278	15.0020	2.17969	5.97965	2.17977	0.00008
10.9994	15.0020	1.80724	5.44581	1.80742	0.00018
2.9654	15.0015	1.45788	4.89174	1.45784	-0.00004

Conductivity = $(af^m + bf^2 + c + dt) / 10$ Siemens/meter

Residual = instrument conductivity - bath conductivity

NOTE: Multiply Siemens/meter by 10 to obtain mmho/cm



S E A - B I R D   E L E C T R O N I C S ,   I N C .
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

CONDUCTIVITY CALIBRATION DATA
CALIBRATION DATE: 5-13-88

PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

SENSOR SERIAL NUMBER = 166

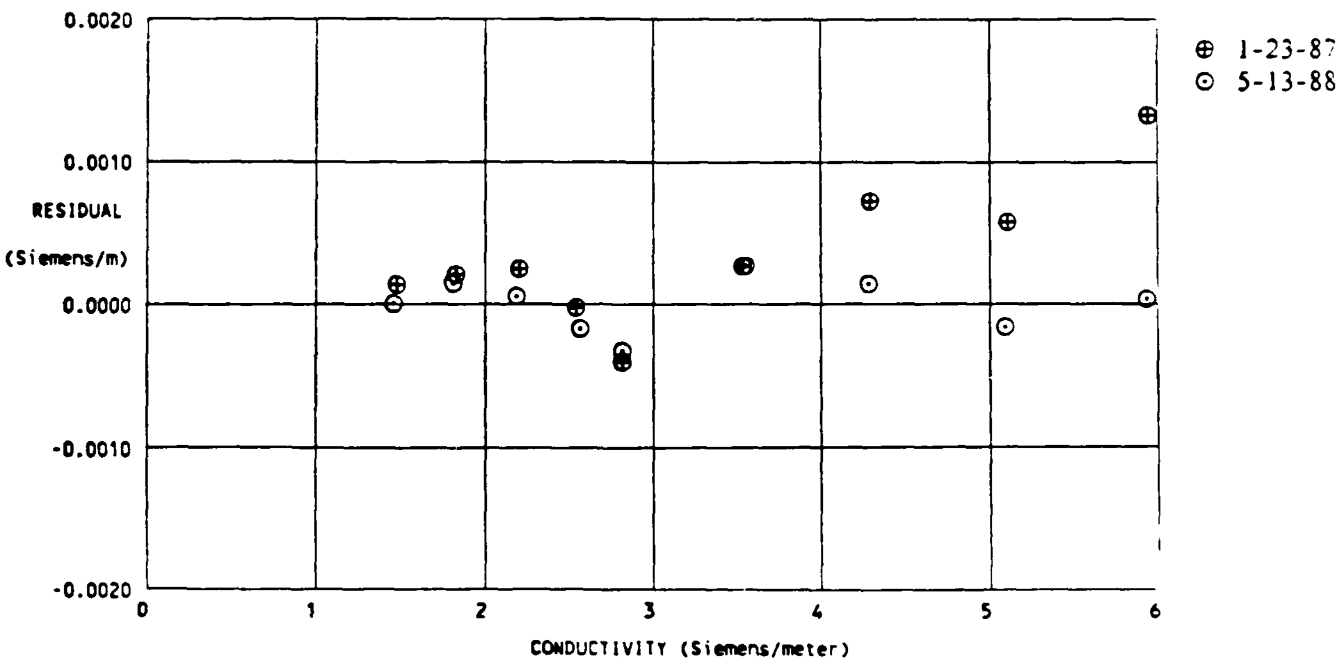
a = 2.94366211e-09   b = 5.40870483e-01
c = -6.87454164e-03   d = 2.01335783e-04
m = 7.8

BATH TEMP (°C)	BATH SAL (°/oo)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
30.9848	34.9371	5.93095	10.44863	5.93098	0.00003
23.0058	34.9369	5.09113	9.68821	5.09097	-0.00016
14.9829	34.9373	4.28285	8.89139	4.28299	0.00014
7.3036	34.9375	3.55064	8.09910	3.55091	0.00027
-1.0032	34.9369	2.81313	7.21051	2.81281	-0.00032
26.8536	15.0019	2.56139	6.88025	2.56122	-0.00017
19.0278	15.0020	2.17969	6.34795	2.17975	0.00006
10.9994	15.0020	1.80724	5.78101	1.80739	0.00015
2.9654	15.0015	1.45788	5.19268	1.45788	0.00000

Conductivity = $(af^m + bf^2 + c + dt) / 10$ Siemens/meter

Residual = instrument conductivity - bath conductivity

NOTE: Multiply Siemens/meter by 10 to obtain mmho/cm



SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

CONDUCTIVITY CALIBRATION DATA
CALIBRATION DATE: 5-13-88

PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

SENSOR SERIAL NUMBER = 179

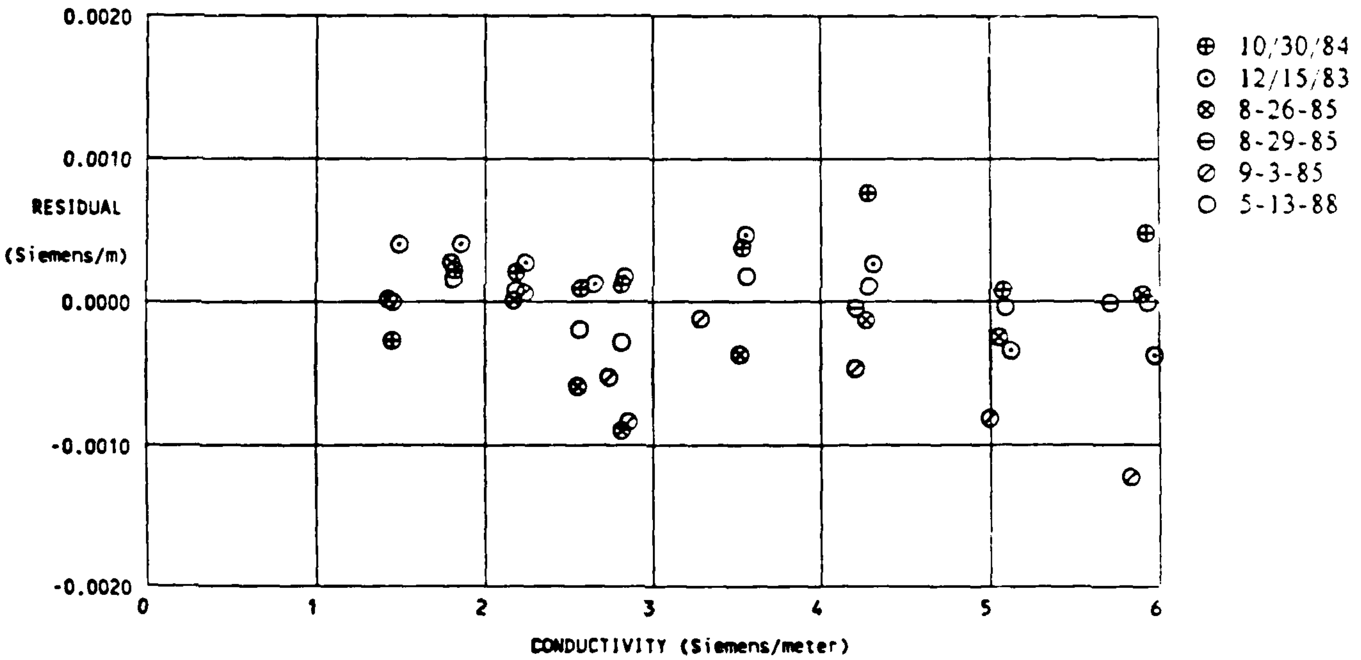
a = 4.03806043e-10 b = 5.51689033e-01
c = -1.55635281e-02 d = 5.57263005e-05
m = 8.6

BATH TEMP (°C)	BATH SAL (°/oo)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
30.9848	34.9371	5.93095	10.35076	5.93094	-0.00001
23.0058	34.9369	5.09113	9.59704	5.09109	-0.00004
14.9829	34.9373	4.28285	8.80696	4.28296	0.00011
7.3036	34.9375	3.55064	8.02162	3.55082	0.00018
-1.0032	34.9369	2.81313	7.14131	2.81285	-0.00028
26.8536	15.0019	2.56139	6.81464	2.56119	-0.00020
19.0278	15.0020	2.17969	6.28743	2.17977	0.00008
10.9994	15.0020	1.80724	5.72590	1.80740	0.00016
2.9654	15.0015	1.45788	5.14322	1.45788	0.00000

Conductivity = $(af^m + bf^2 + c + dt) / 10$ Siemens/meter

Residual = *instrument conductivity - bath conductivity*

NOTE: Multiply Siemens/meter by 10 to obtain mmho/cm



APPENDIX C

Post-Cruise SBE Sensor Calibration Sheets

S E A - B I R D   E L E C T R O N I C S ,   I N C .
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866   Telex: 292915 SBEI UR

TEMPERATURE CALIBRATION DATA
CALIBRATION DATE: 11-4-88

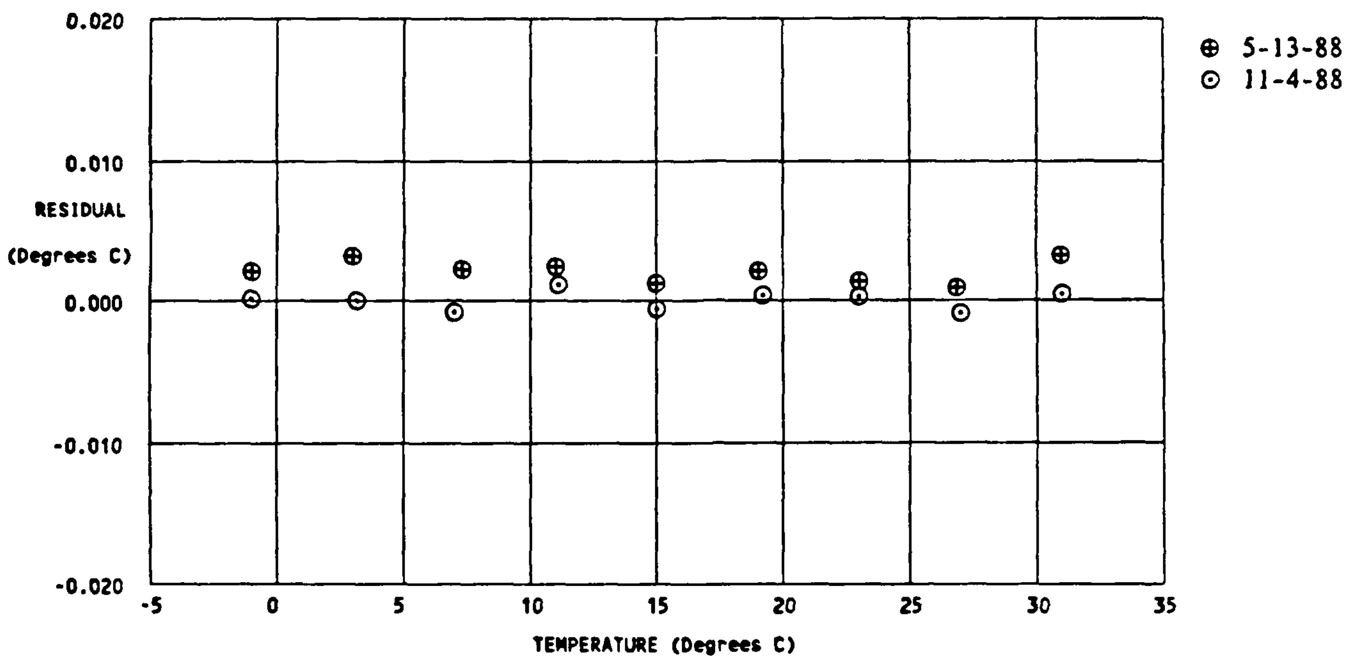
SENSOR SERIAL NUMBER = 574

a = 3.67451689e-03   b = 6.00468902e-04
c = 1.58907674e-05   d = 2.57904191e-06
f_o = 5345.40

BATH TEMP (°C)	INSTRUMENT FREQ (Hz)	INST TEMP (°C)	RESIDUAL (°C)
31.0071	10282.41	31.0075	0.00044
23.0102	8833.91	23.0105	0.00027
15.0095	7532.75	15.0089	-0.00059
7.0007	6371.86	6.9999	-0.00082
-1.0055	5345.40	-1.0054	0.00012
26.9893	9535.52	26.9884	-0.00091
19.1917	8194.91	19.1921	0.00037
11.1012	6949.27	11.1023	0.00112
3.1476	5861.69	3.1476	0.00001

Temperature = $1/\{a + b[\ln(f_o/f)] + c[\ln^2(f_o/f)] + d[\ln^3(f_o/f)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



S E A - B I R D   E L E C T R O N I C S ,   I N C .
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866   Telex: 292915 SBEI UR

TEMPERATURE CALIBRATION DATA
CALIBRATION DATE: 11-4-88

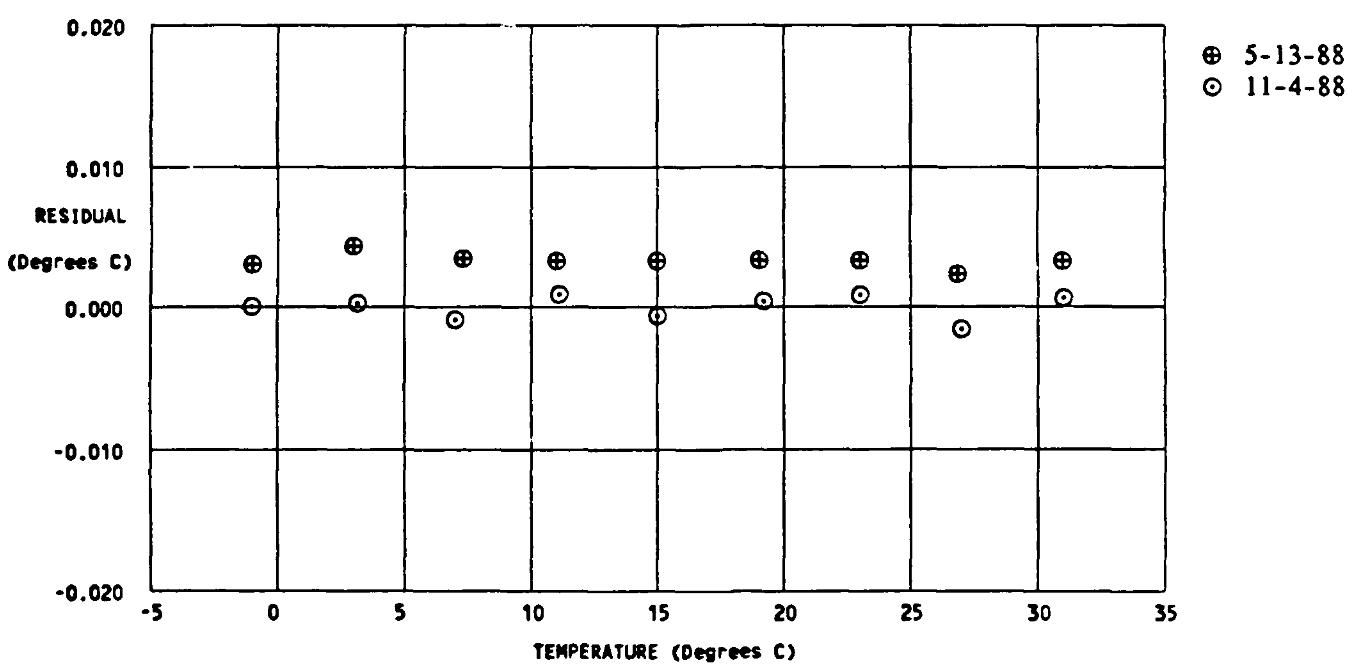
SENSOR SERIAL NUMBER = 575

a = 3.67451819e-03   b = 6.12308153e-04
c = 1.80093155e-05   d = 2.19448745e-06
f_0 = 5909.22

BATH TEMP (°C)	INSTRUMENT FREQ (Hz)	INST TEMP (°C)	RESIDUAL (°C)
31.0071	11238.47	31.0077	0.00063
23.0102	9678.32	23.0111	0.00085
15.0095	8274.85	15.0089	-0.00062
7.0007	7020.61	6.9998	-0.00090
-1.0055	5909.22	-1.0055	0.00002
26.9893	10434.03	26.9878	-0.00154
19.1917	8989.29	19.1921	0.00038
11.1012	7644.73	11.1021	0.00090
3.1476	6468.61	3.1479	0.00028

Temperature = $1/(a + b[\ln(f_0/f)] + c[\ln^2(f_0/f)] + d[\ln^3(f_0/f)]) - 273.15$ (°C)

Residual = instrument temperature - bath temperature



SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

CONDUCTIVITY CALIBRATION DATA
CALIBRATION DATE: 11-4-88

PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

SENSOR SERIAL NUMBER = 166

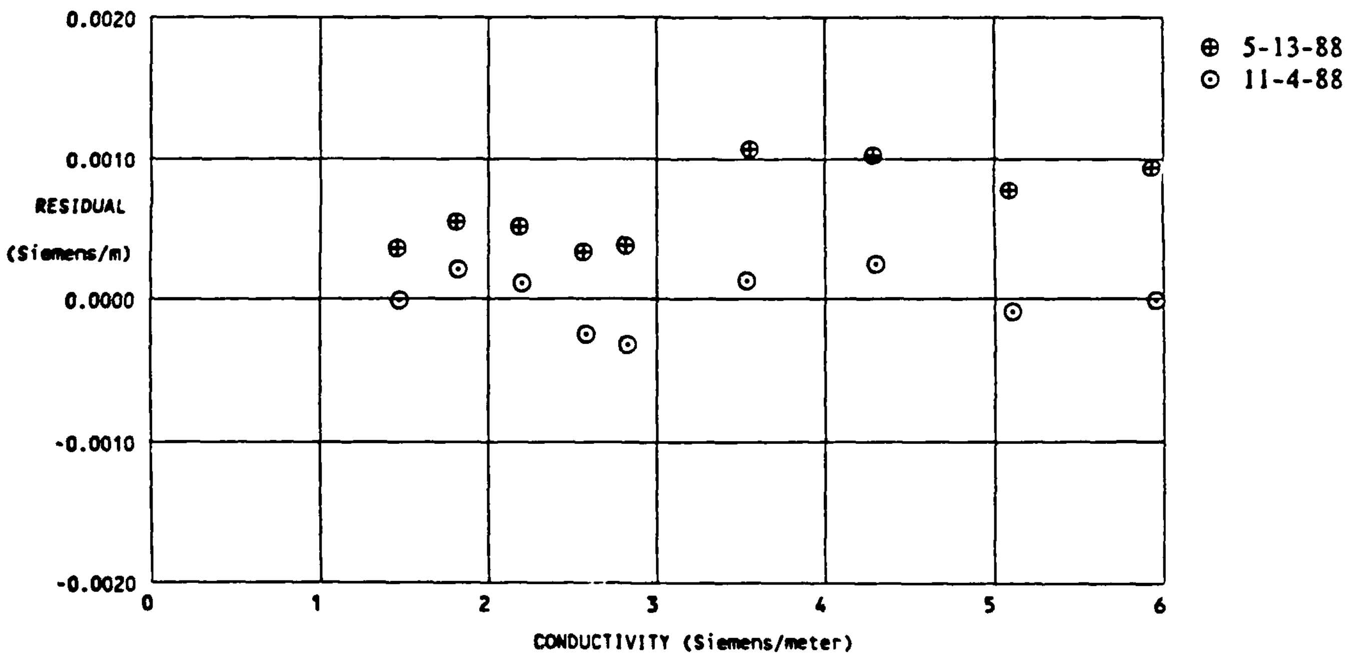
a = 2.89456655e-09 b = 5.41008568e-01
c = -6.93901929e-03 d = 1.49368007e-04
m = 7.8

BATH TEMP (°C)	BATH SAL (°/oo)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
31.0071	35.0493	5.95023	10.46456	5.95022	-0.00001
23.0102	35.0497	5.10621	9.70162	5.10612	-0.00009
15.0095	35.0495	4.29776	8.90596	4.29800	0.00024
7.0007	35.0497	3.53287	8.07780	3.53299	0.00012
-1.0055	35.0499	2.82119	7.21994	2.82087	-0.00032
26.9893	15.0688	2.57862	6.90256	2.57838	-0.00024
19.1917	15.0680	2.19631	6.37150	2.19641	0.00010
11.1012	15.0673	1.81906	5.79933	1.81926	0.00020
3.1476	15.0671	1.47142	5.21607	1.47141	-0.00001

Conductivity = $(af^m + bf^2 + c + dt) / [10(1 - 9.57e^{-8}p)]$ Siemens/meter, where p = pressure in decibars

Residual = instrument conductivity - bath conductivity

NOTE: Multiply Siemens/meter by 10 to obtain mmho/cm



SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington 98005
Telephone: (206) 643-9866 Telex: 292915 SBEI UR

CONDUCTIVITY CALIBRATION DATA
CALIBRATION DATE: 11-4-88

PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

SENSOR SERIAL NUMBER = 179

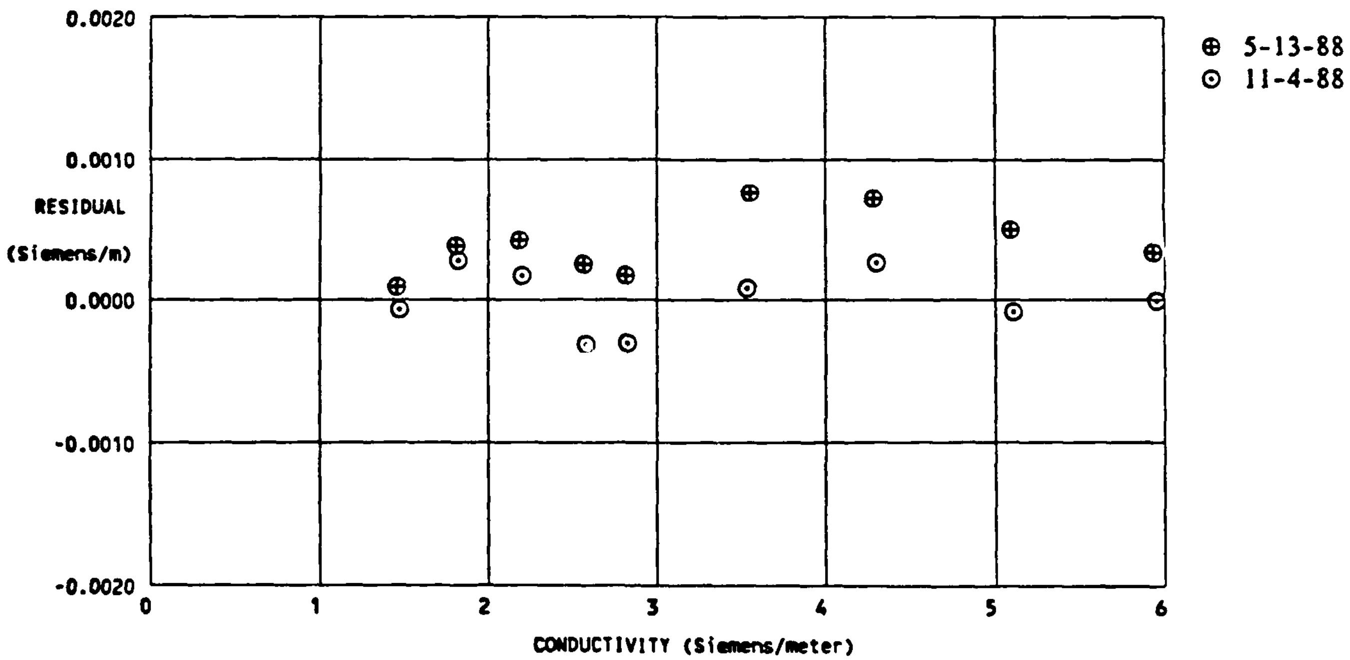
a = 2.36990405e-10 b = 5.51882949e-01
c = -1.97496806e-02 d = 7.17699845e-05
m = 8.8

BATH TEMP (°C)	BATH SAL (°/oo)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
31.0071	35.0493	5.95023	10.36708	5.95022	-0.00001
23.0102	35.0497	5.10621	9.61060	5.10612	-0.00009
15.0095	35.0495	4.29776	8.82174	4.29802	0.00026
7.0007	35.0497	3.53287	8.00082	3.53295	0.00008
-1.0055	35.0499	2.82119	7.15092	2.82089	-0.00030
26.9893	15.0688	2.57862	6.83675	2.57831	-0.00031
19.1917	15.0680	2.19631	6.31096	2.19647	0.00016
11.1012	15.0673	1.81906	5.74440	1.81933	0.00027
3.1476	15.0671	1.47142	5.16674	1.47136	-0.00006

Conductivity = $(af^m + bf^2 + c + dt) / [10(1 - 9.57e^{-8}p)]$ Siemens/meter, where p = pressure in decibars

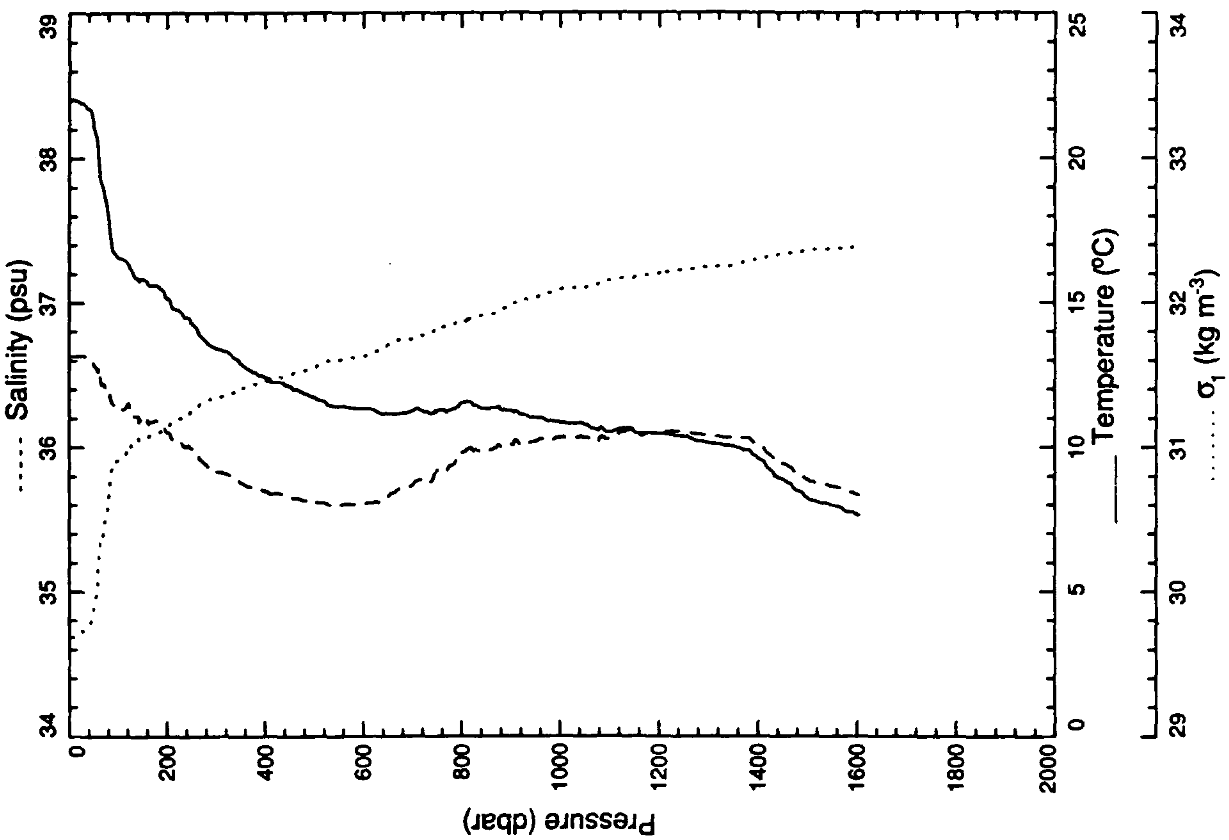
Residual = instrument conductivity - bath conductivity

NOTE: Multiply Siemens/meter by 10 to obtain mmho/cm

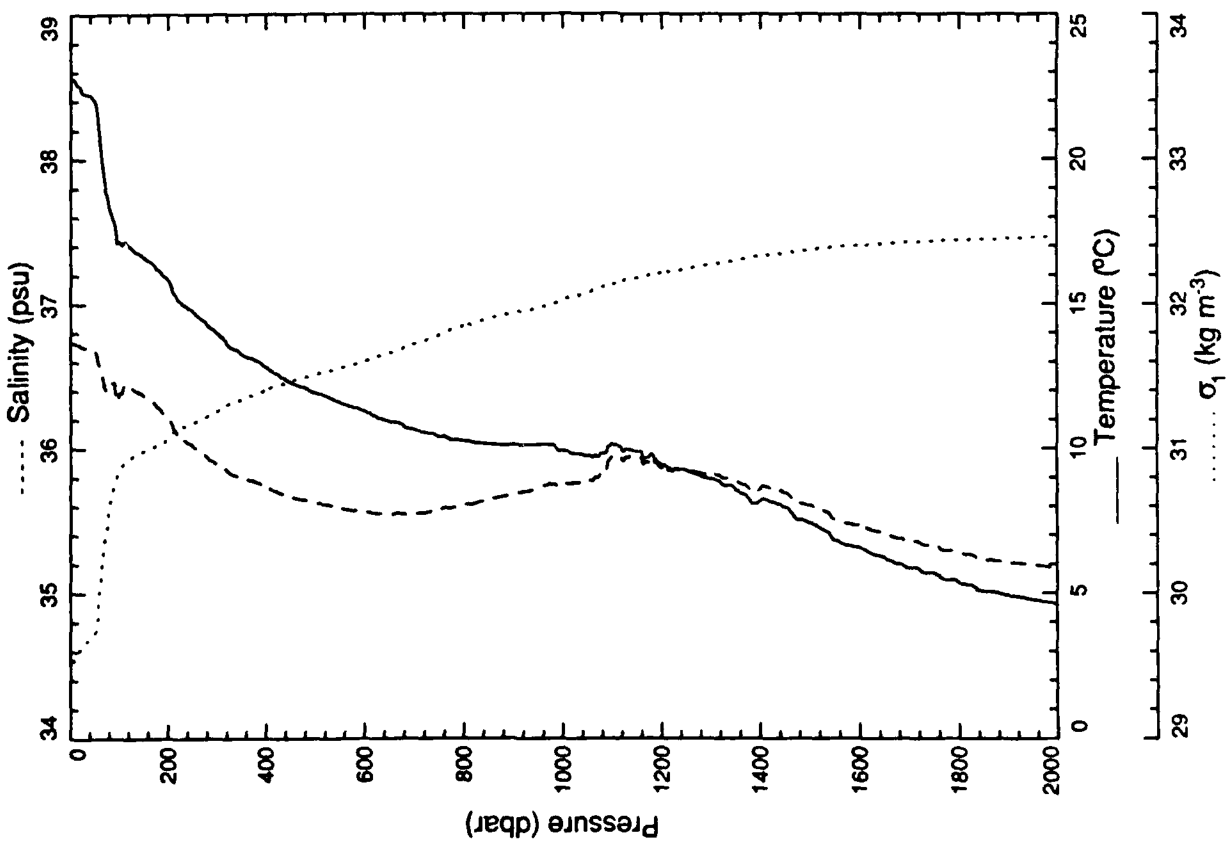


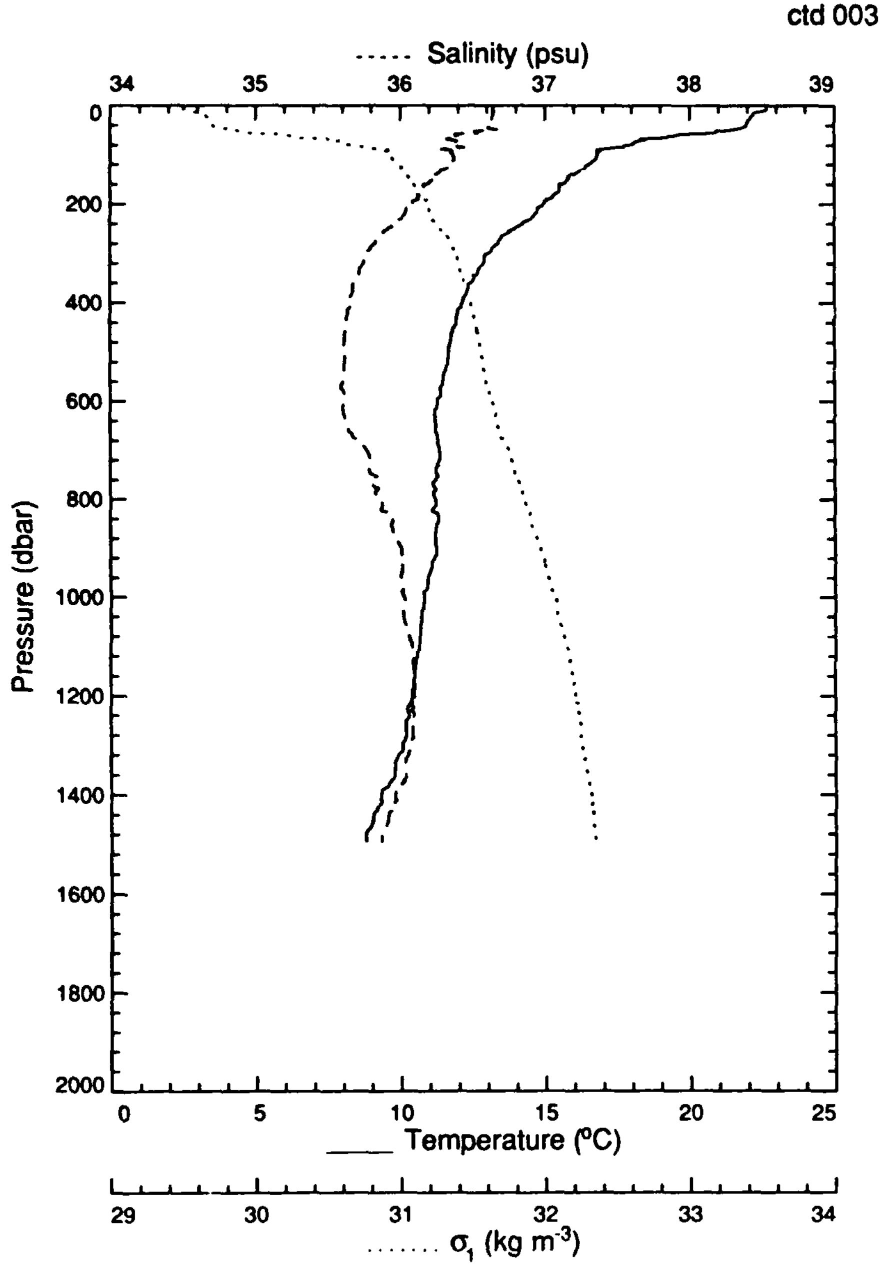
APPENDIX D

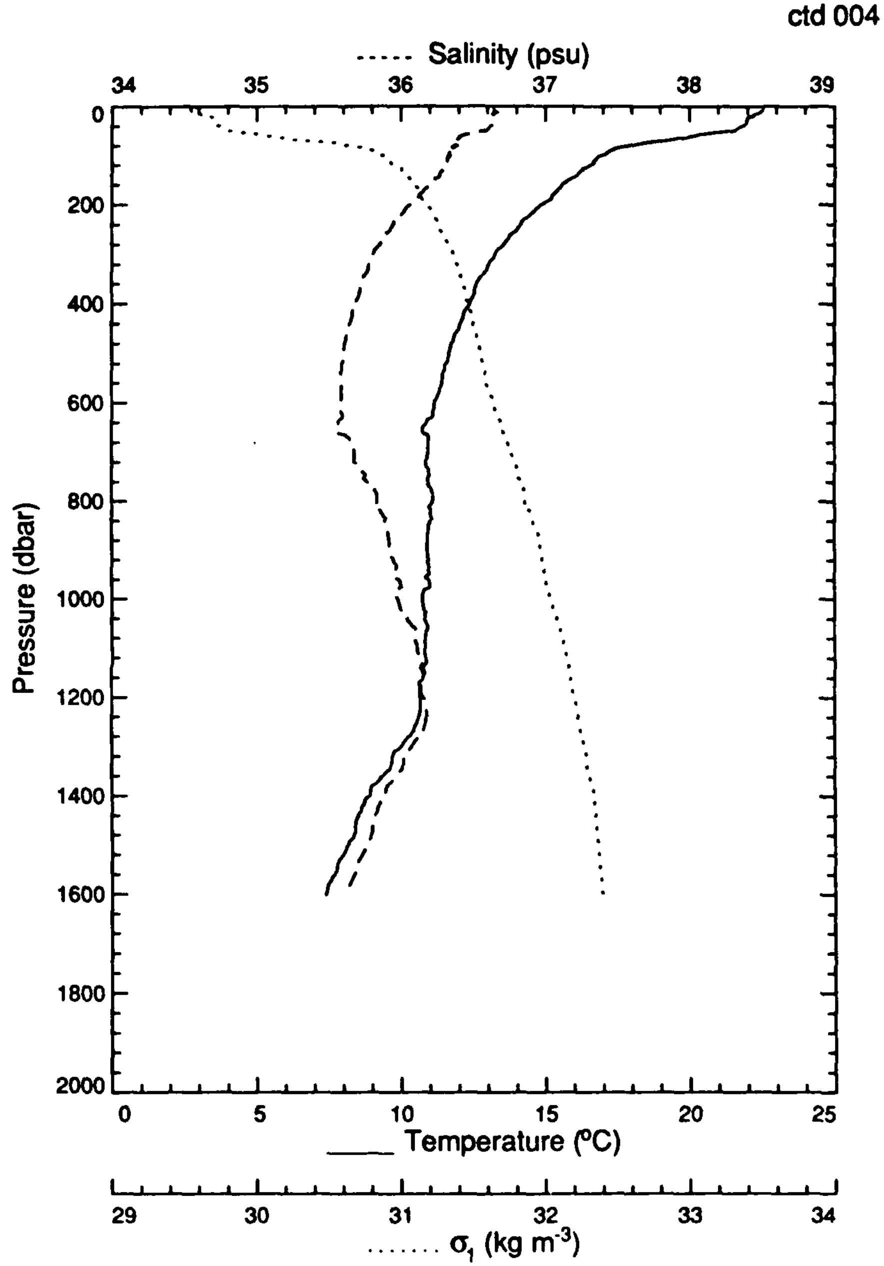
Temperature, Salinity, and σ_1 Profiles ctd 002

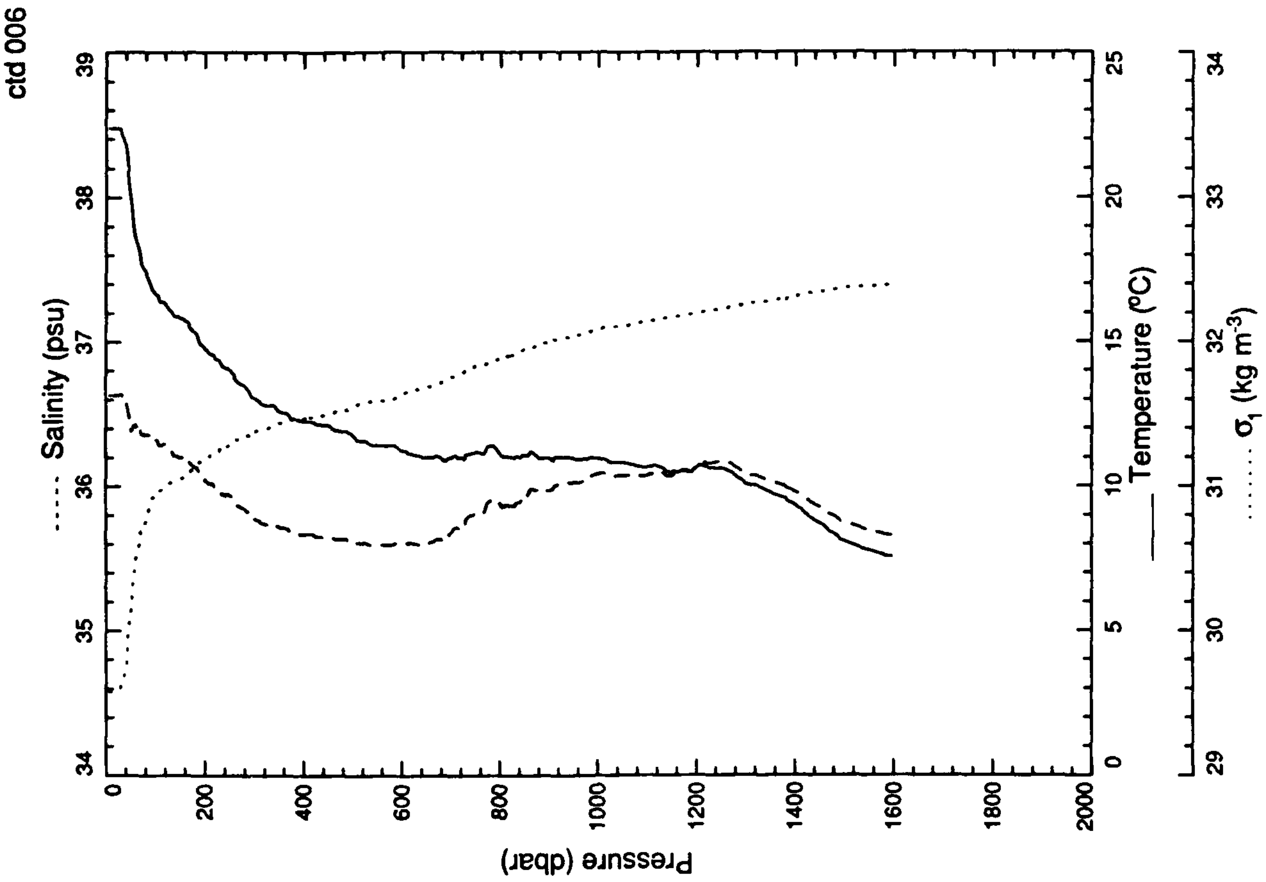


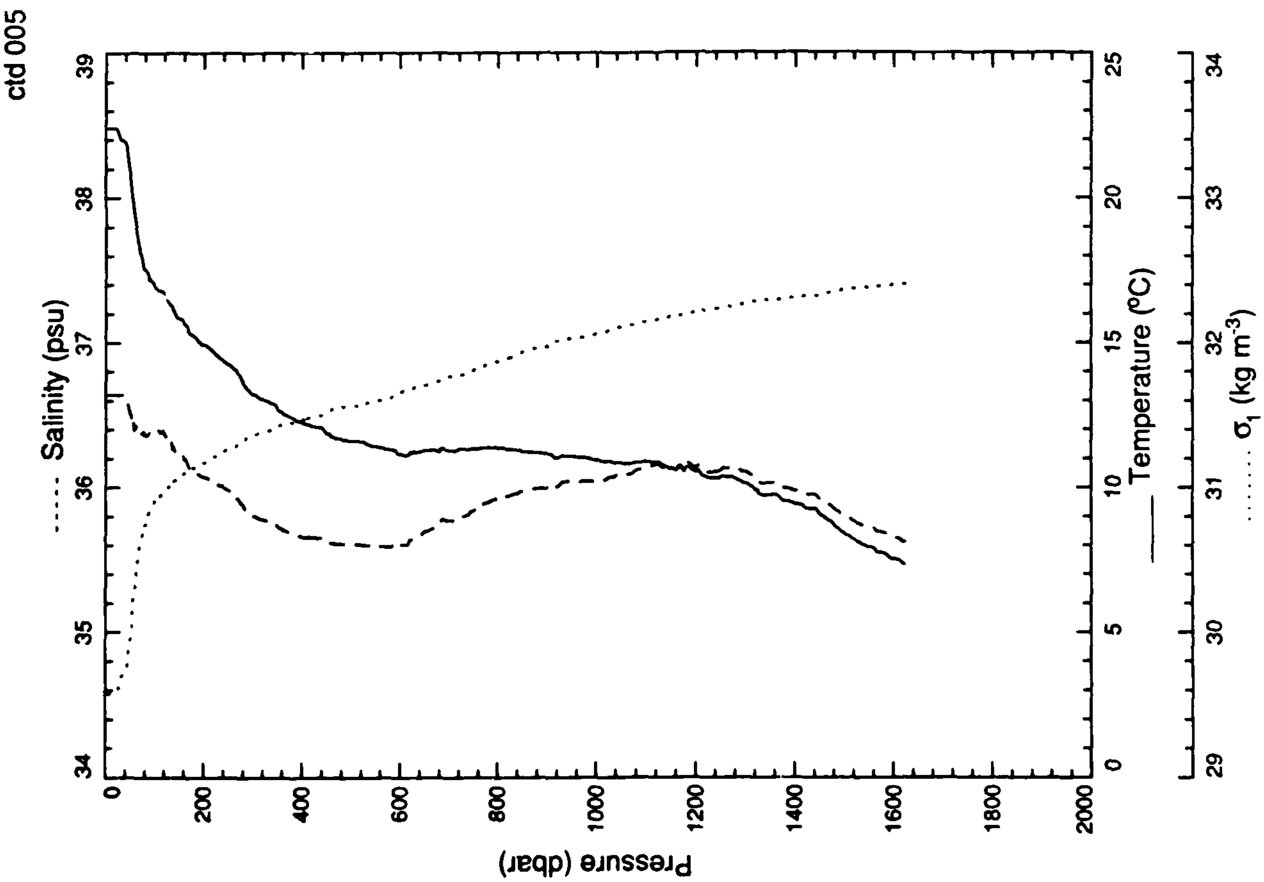
ctd 001

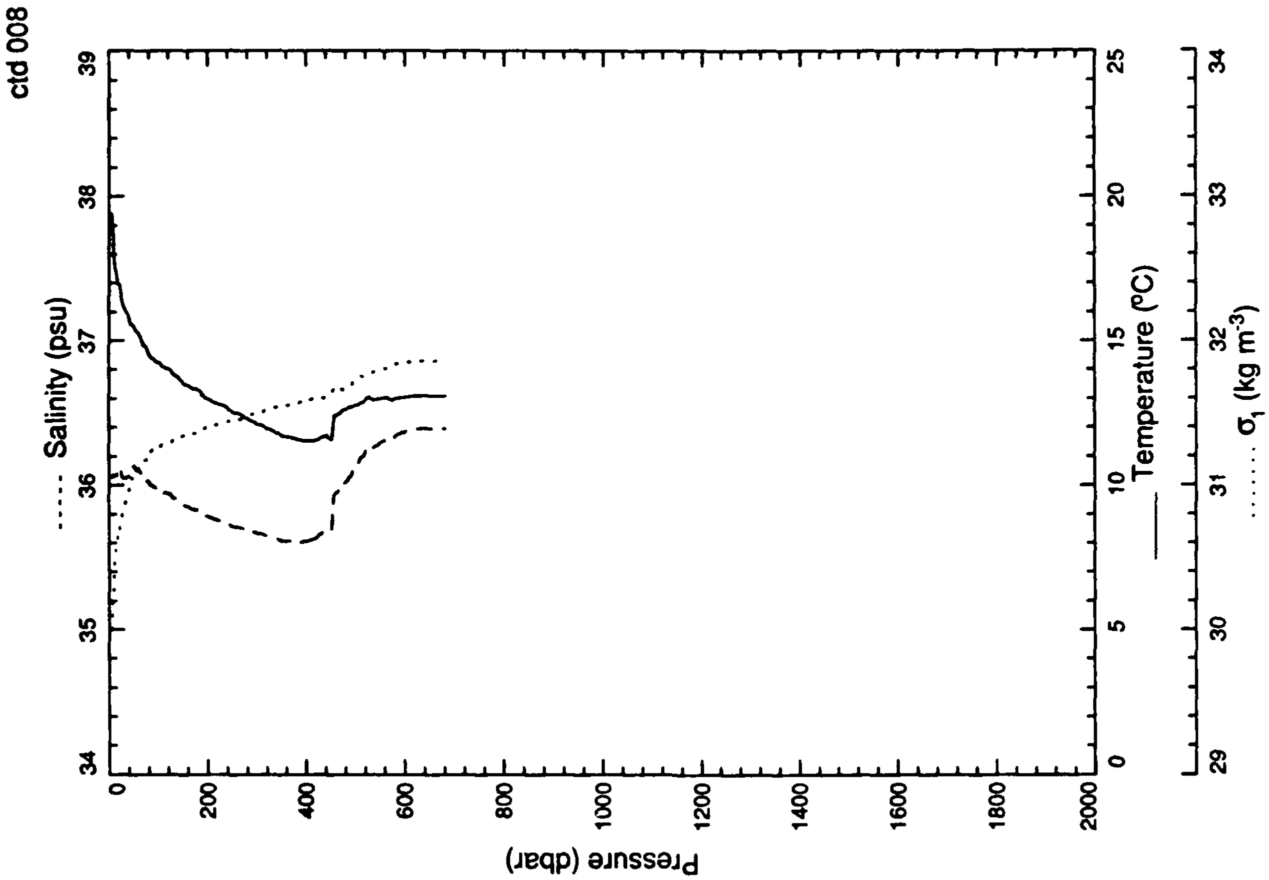


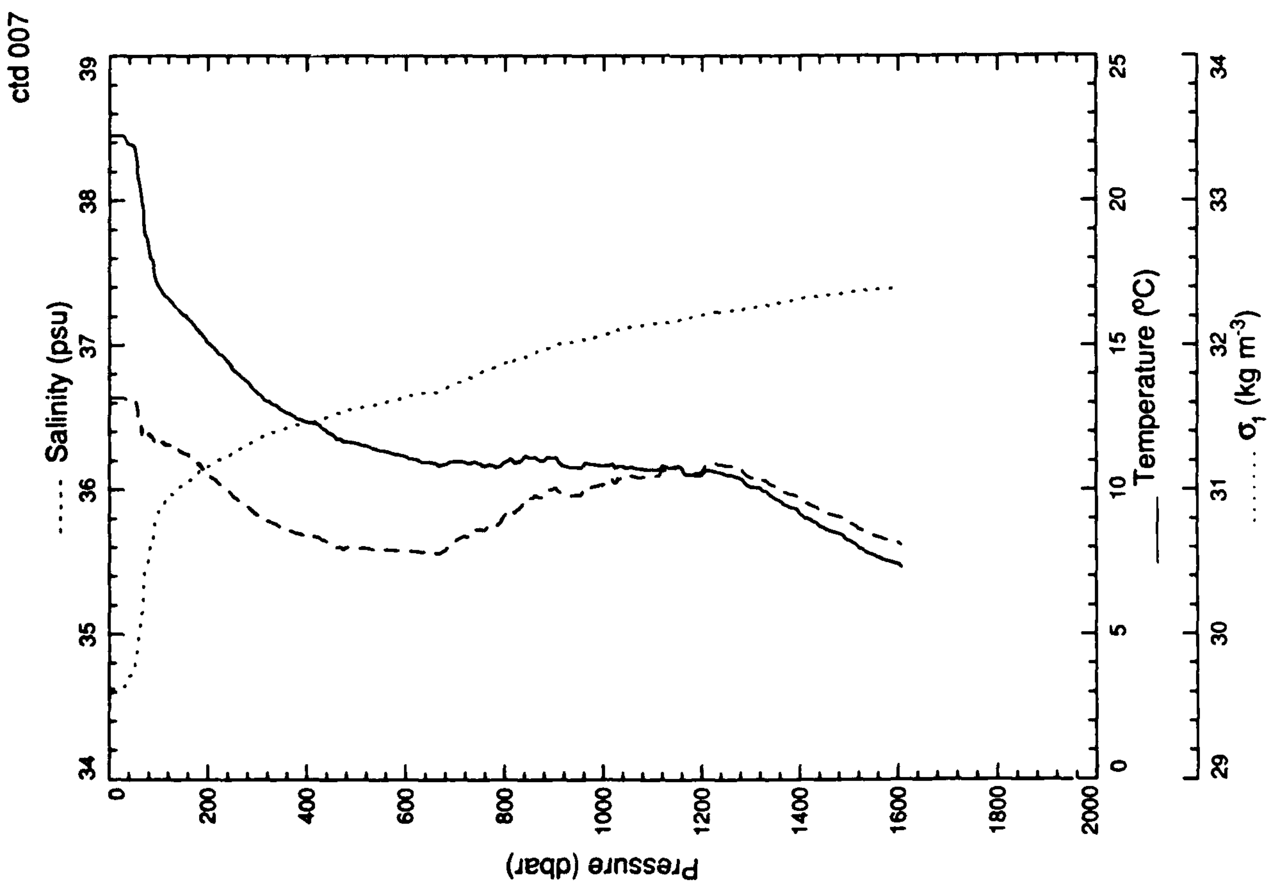

ctd 003
Salinity (psu)
Pressure (dbar)
Temperature (ºC)
σ1 (kg m-3)

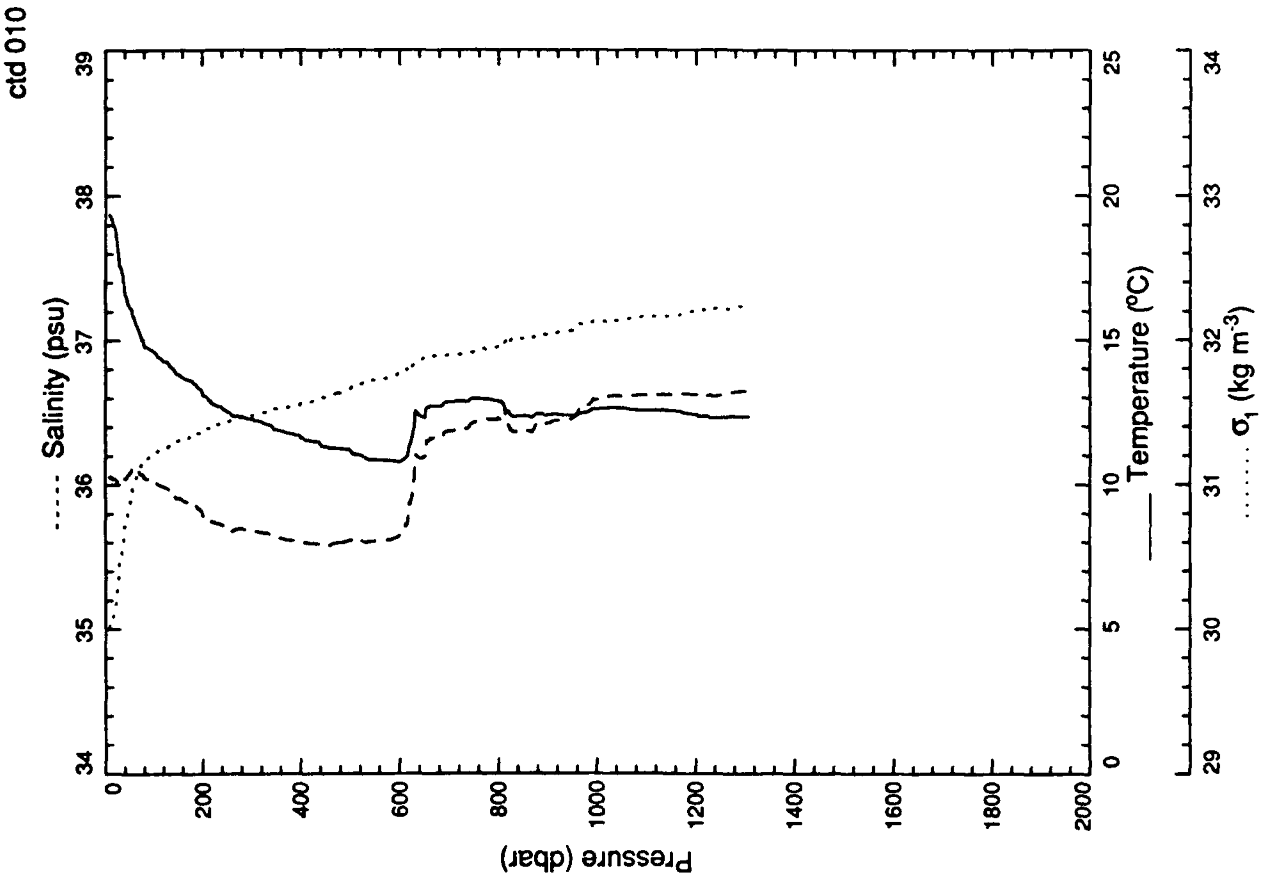

ctd 004
Salinity (psu)
Pressure (dbar)
Temperature (ºC)
σ1 (kg m-3)

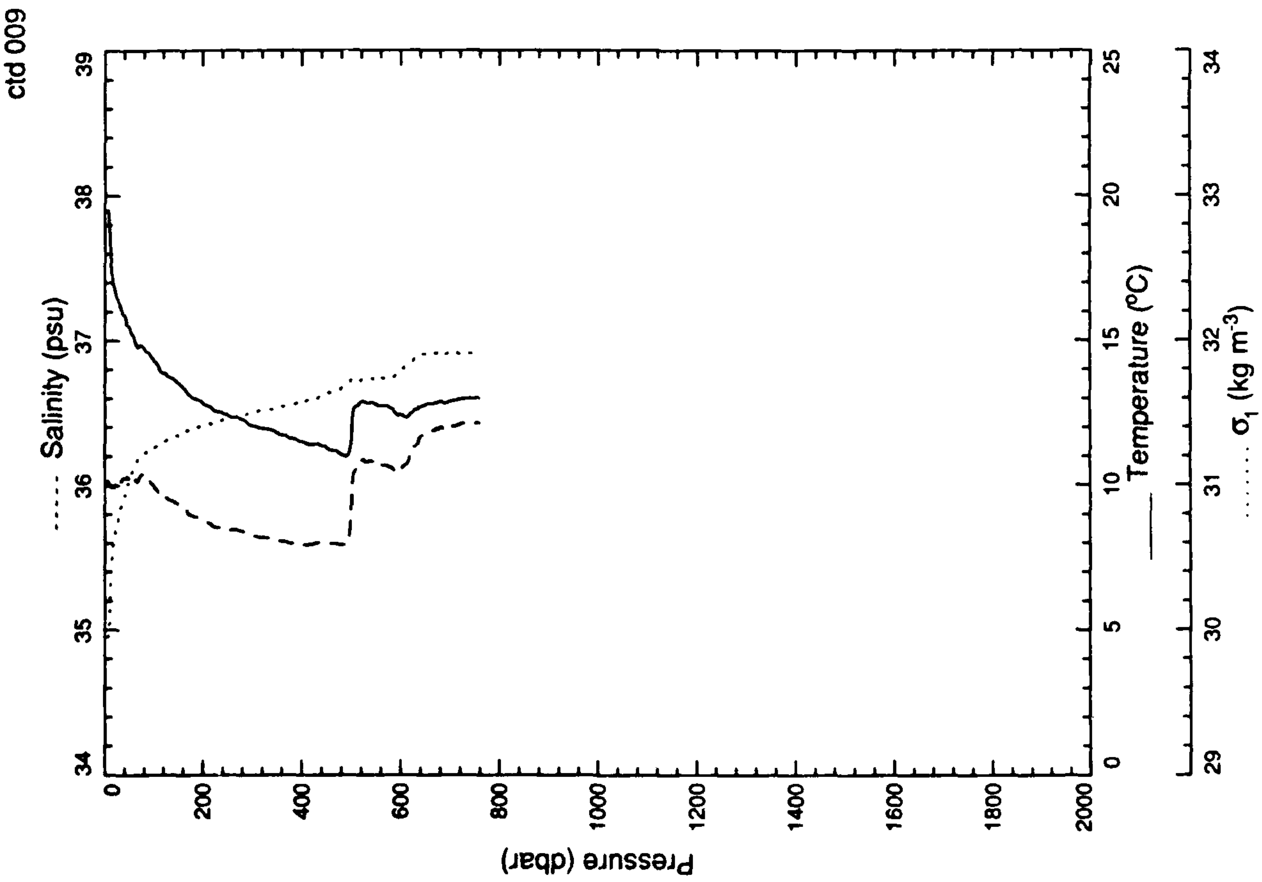

ctd 006
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)

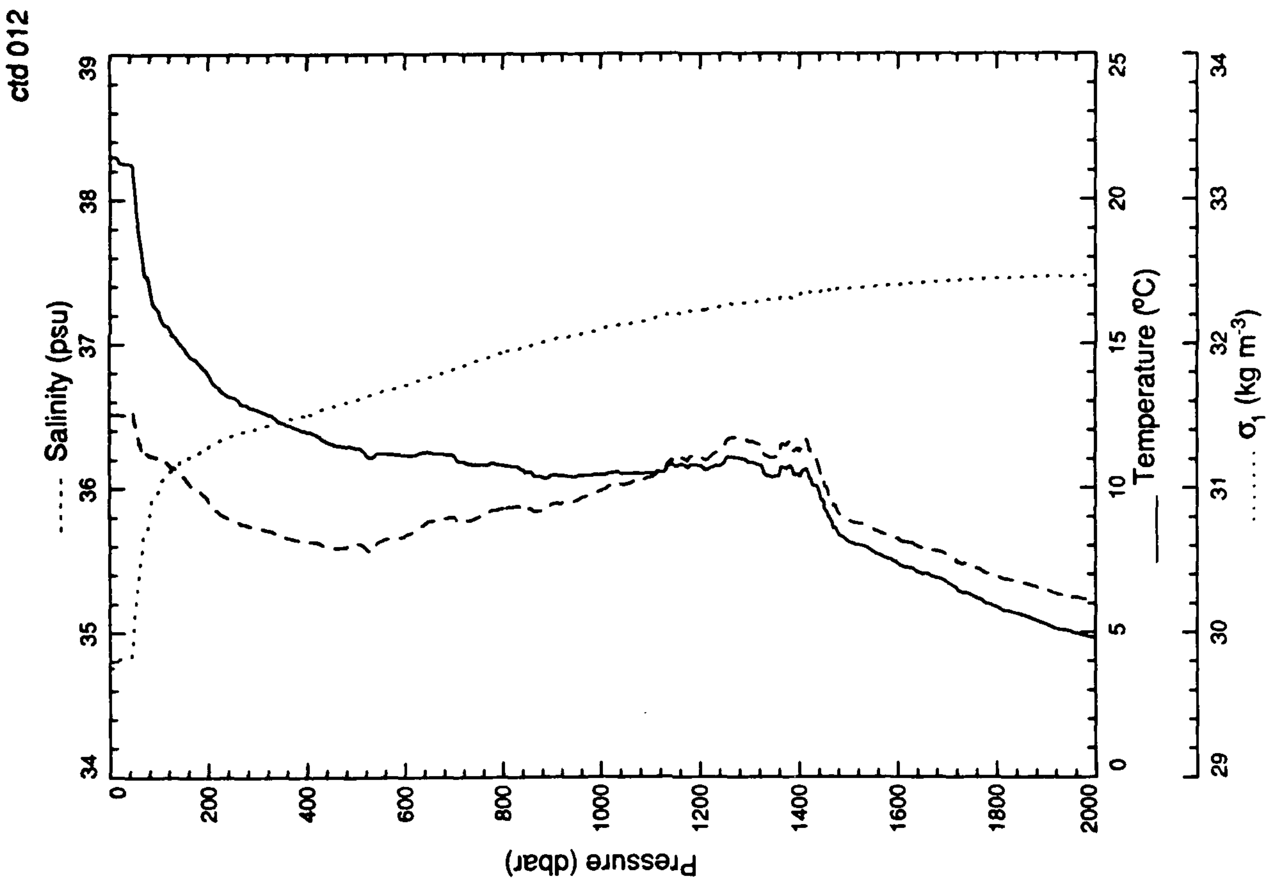

ctd 005
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)

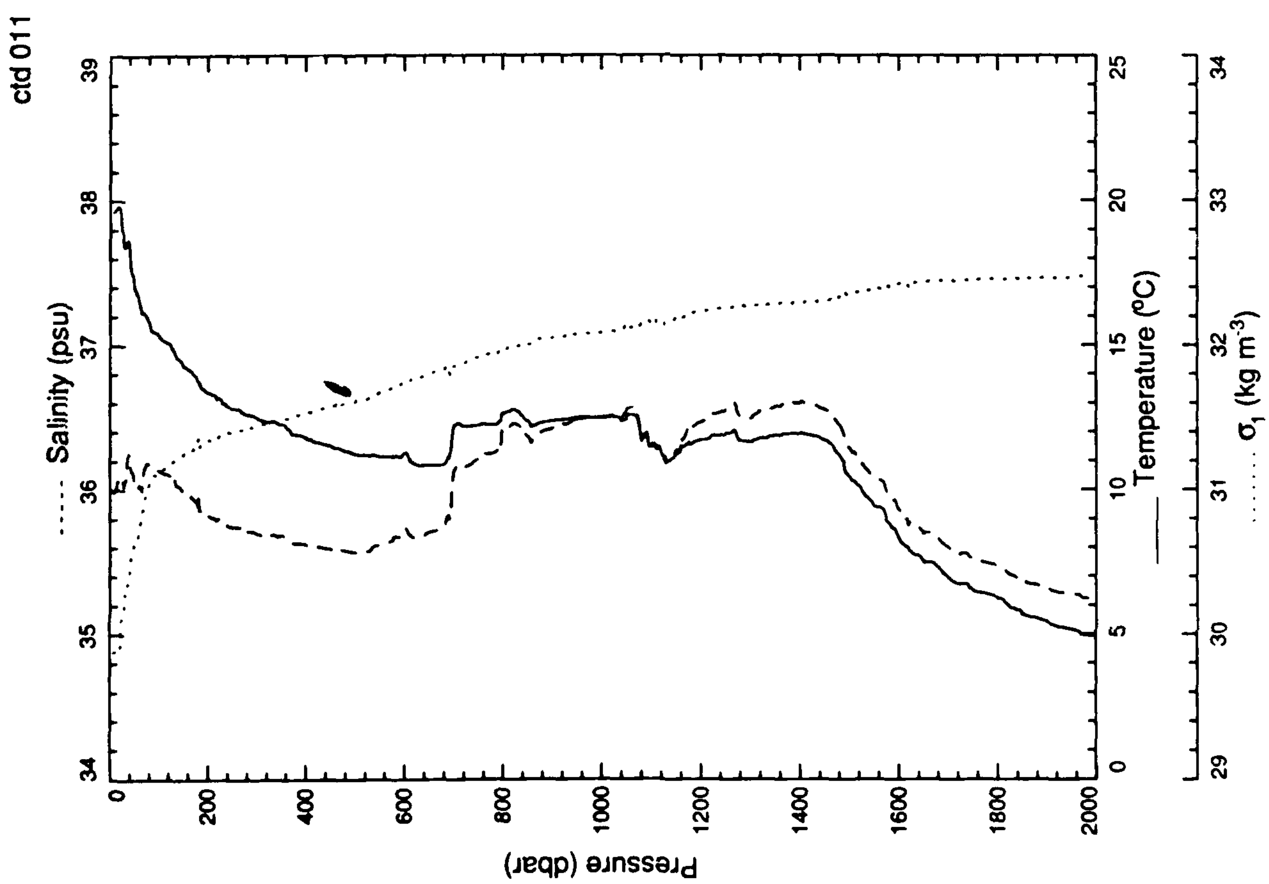

ctd 008
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

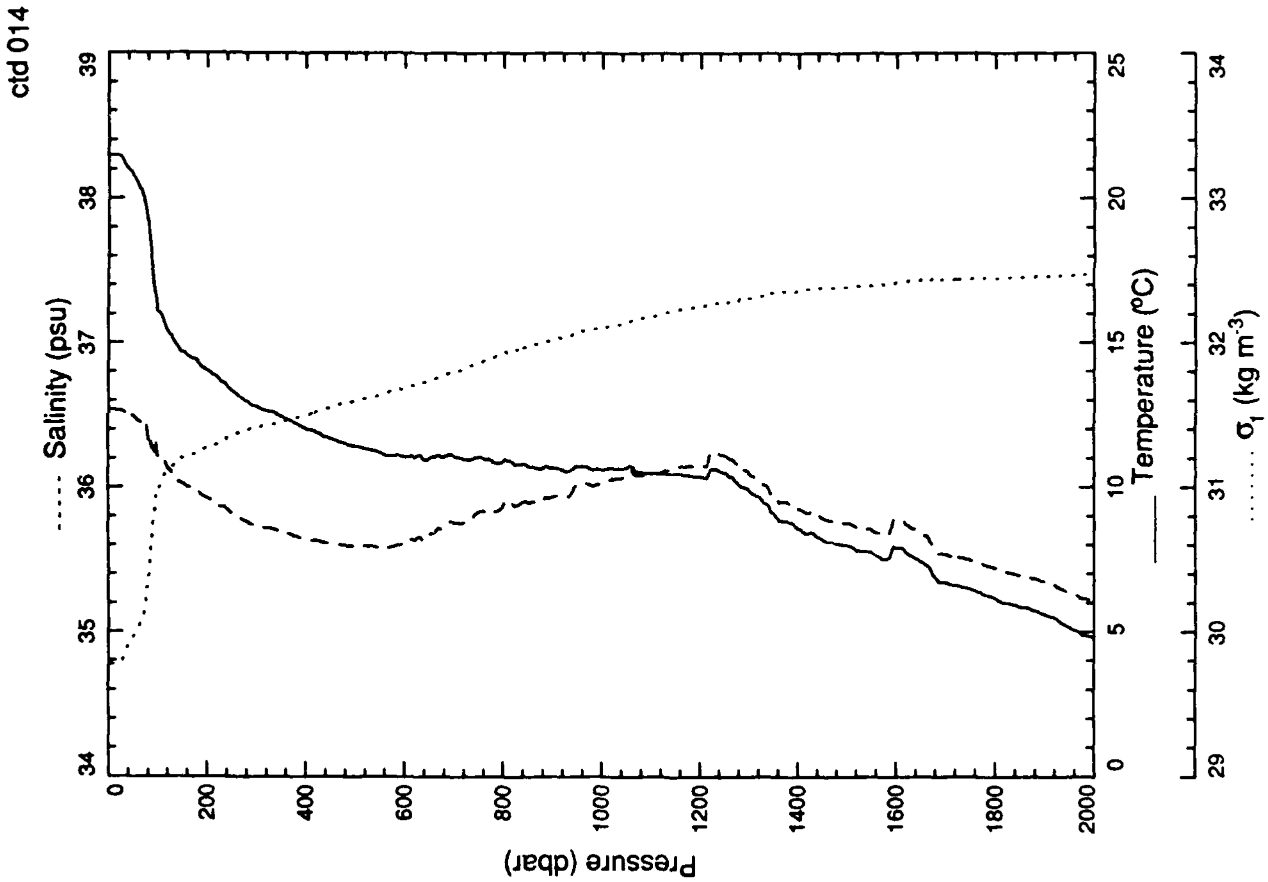

ctd 007
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)


ctd 010
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)


ctd 009
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)


ctd 012
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)


ctd 011
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)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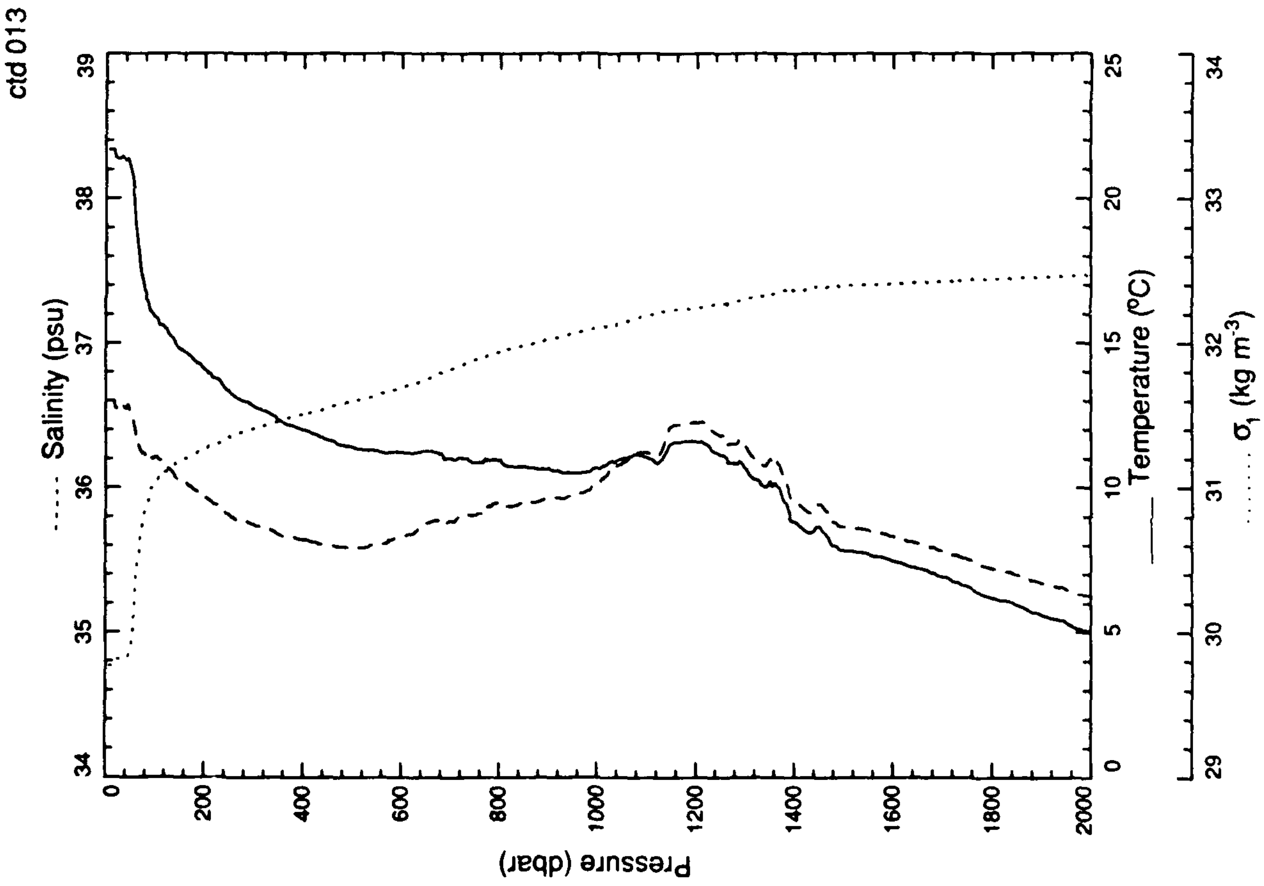
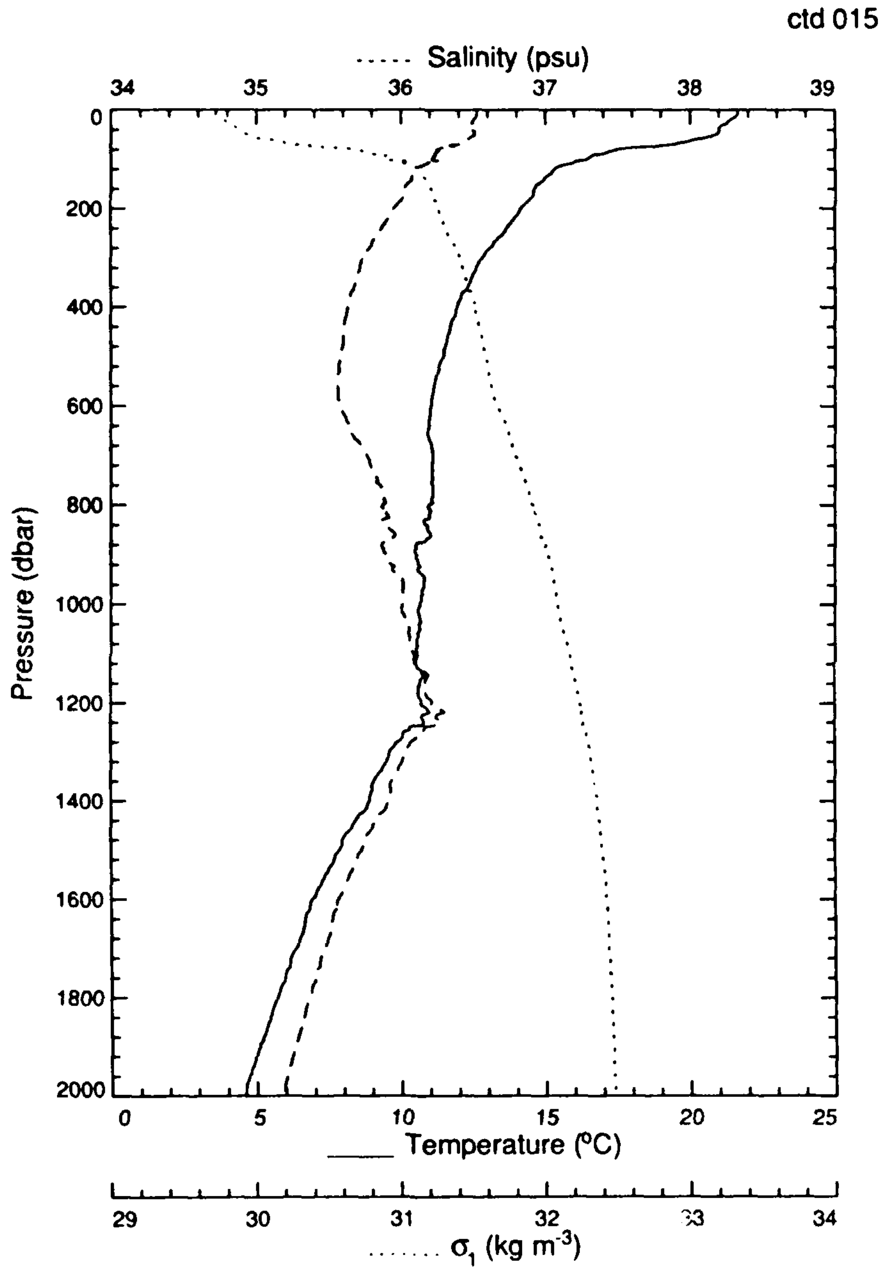
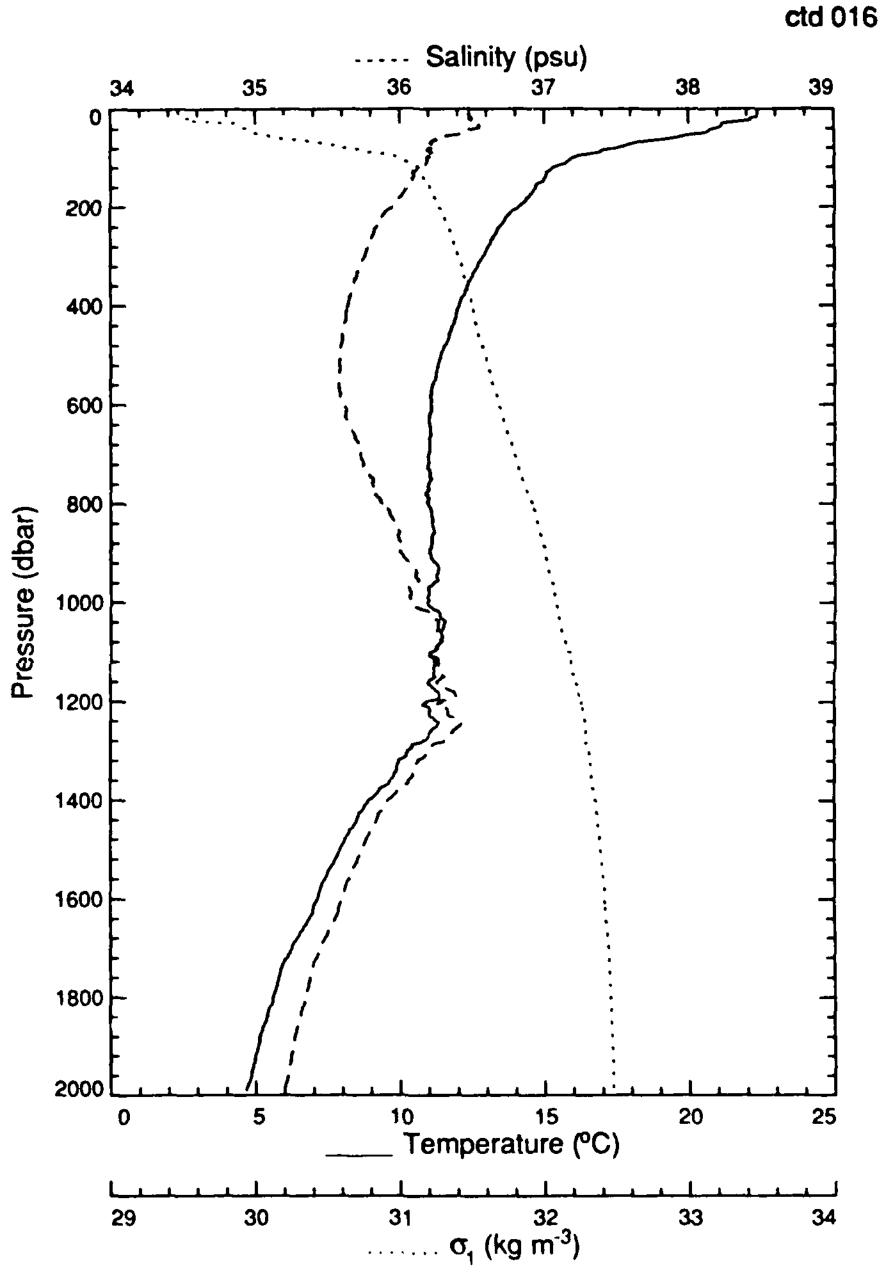
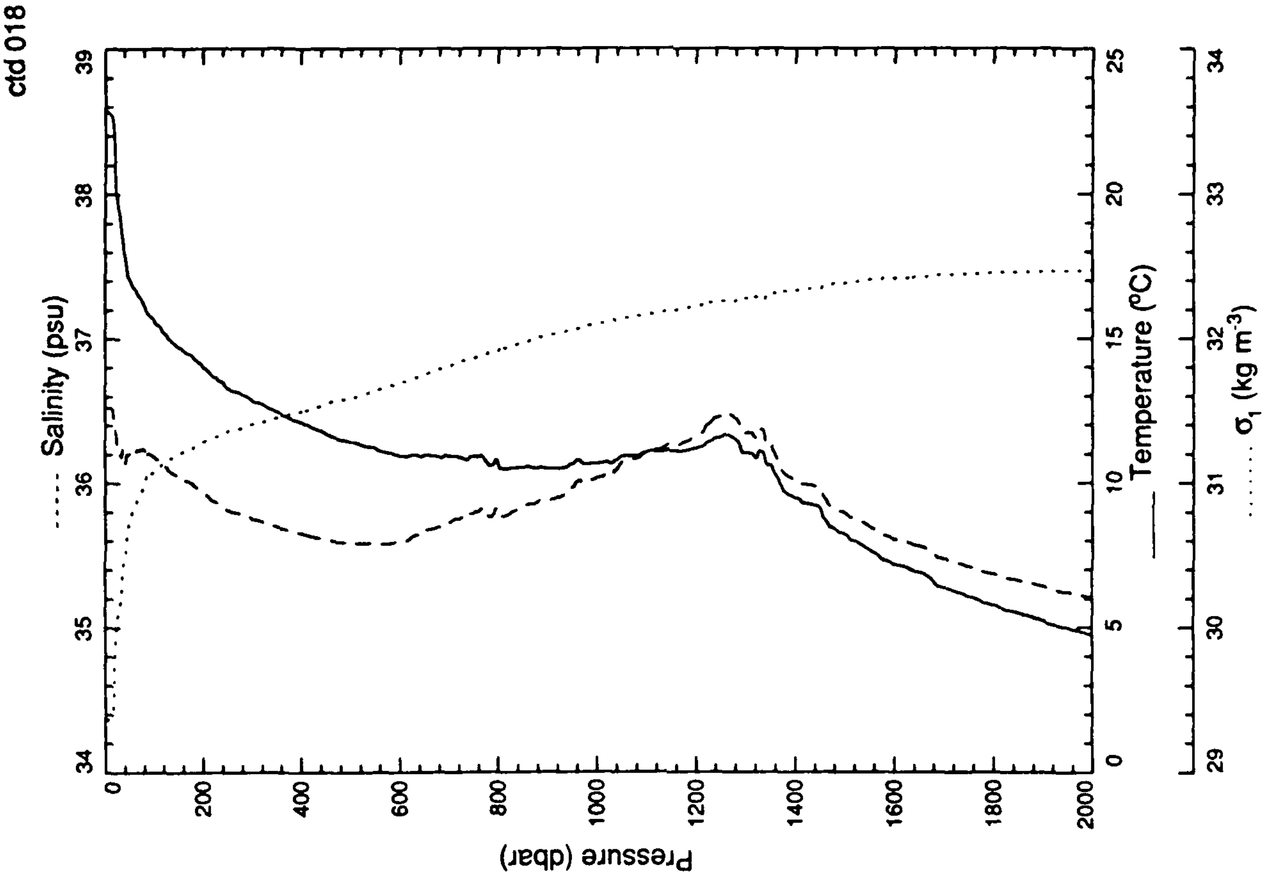
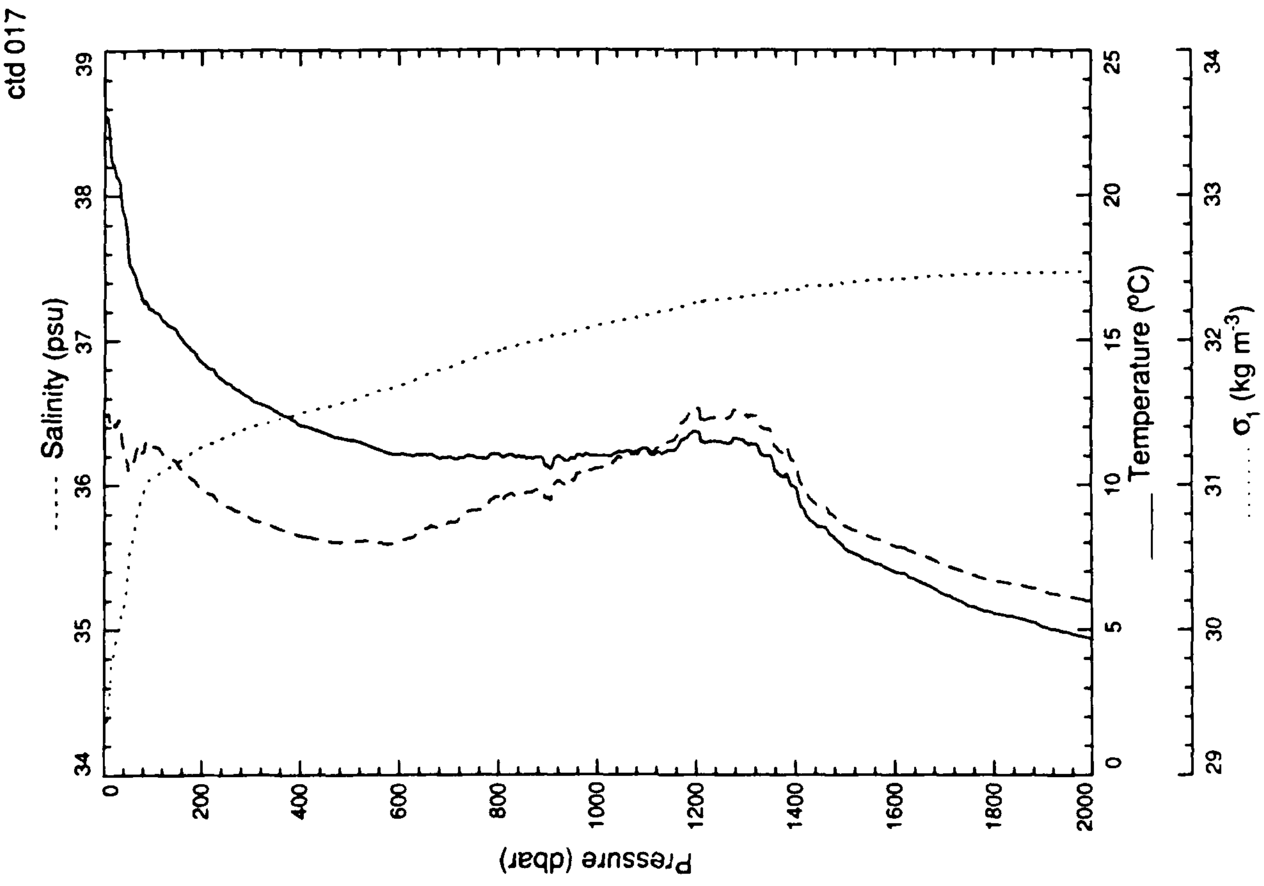
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

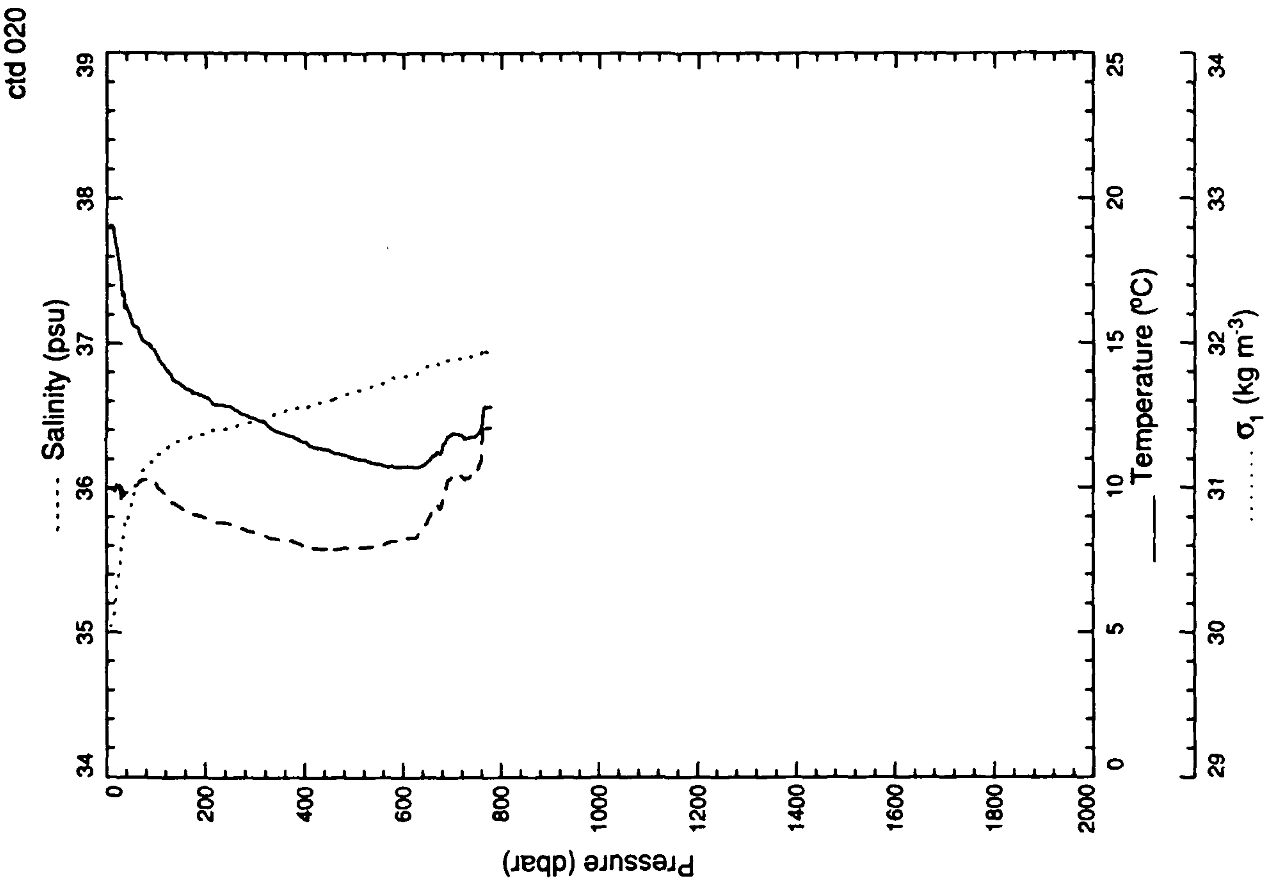

ctd 013
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

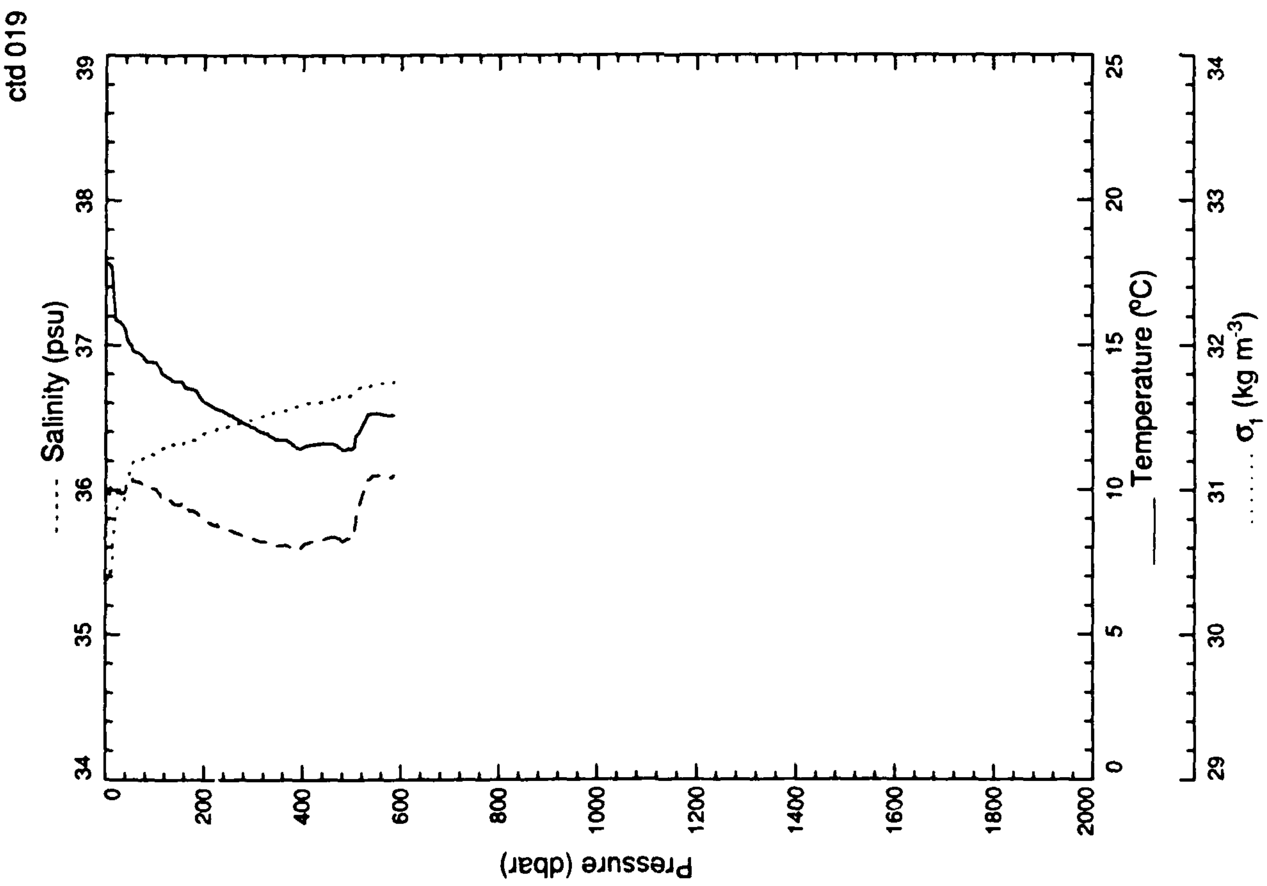

ctd 015
Salinity (psu)
34 35 36 37 38 39
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000
0 5 10 15 20 25
Temperature (°C)
29 30 31 32 33 34
σ_1 (kg m^{-3})

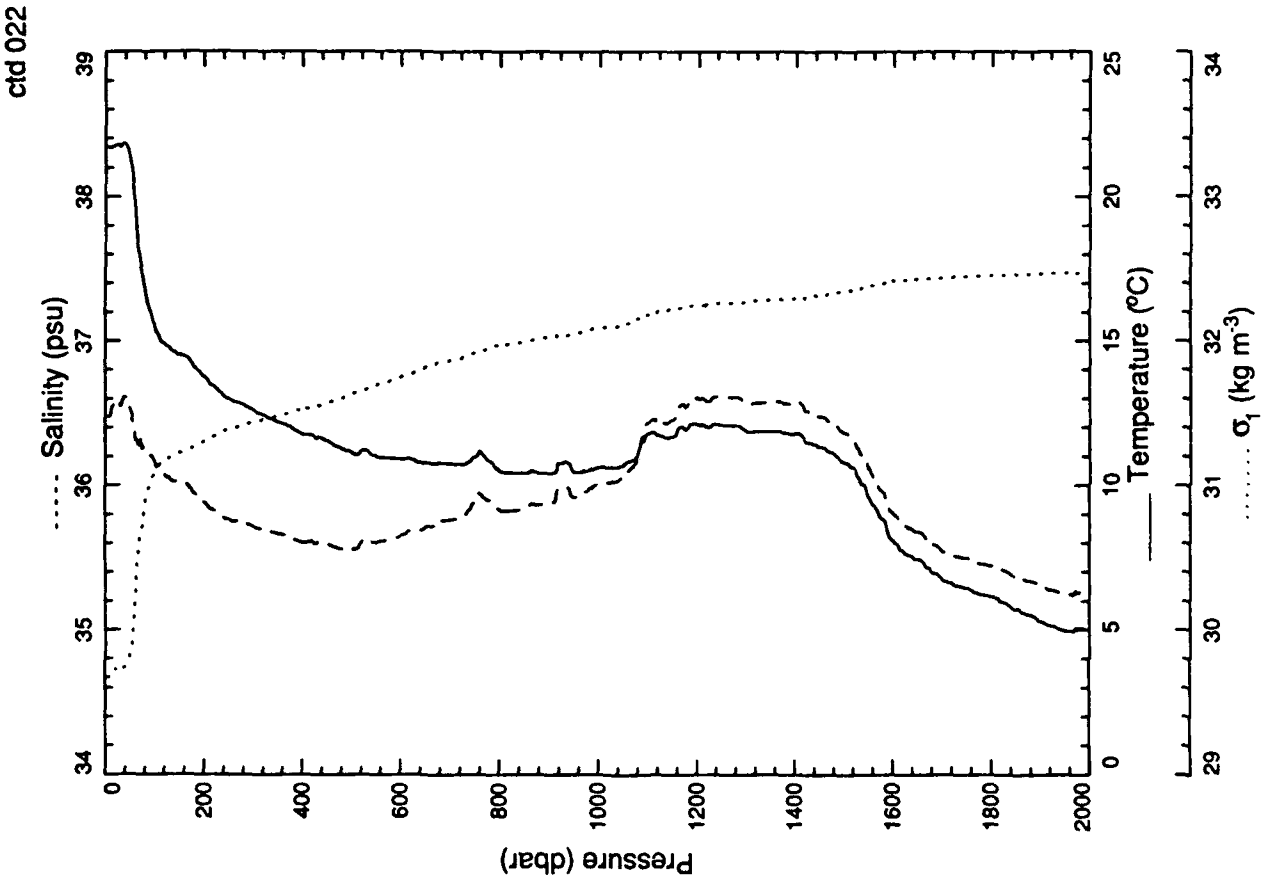

ctd 016
Salinity (psu)
34 35 36 37 38 39
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000
0 5 10 15 20 25
Temperature (°C)
29 30 31 32 33 34
σ_1 (kg m^{-3})

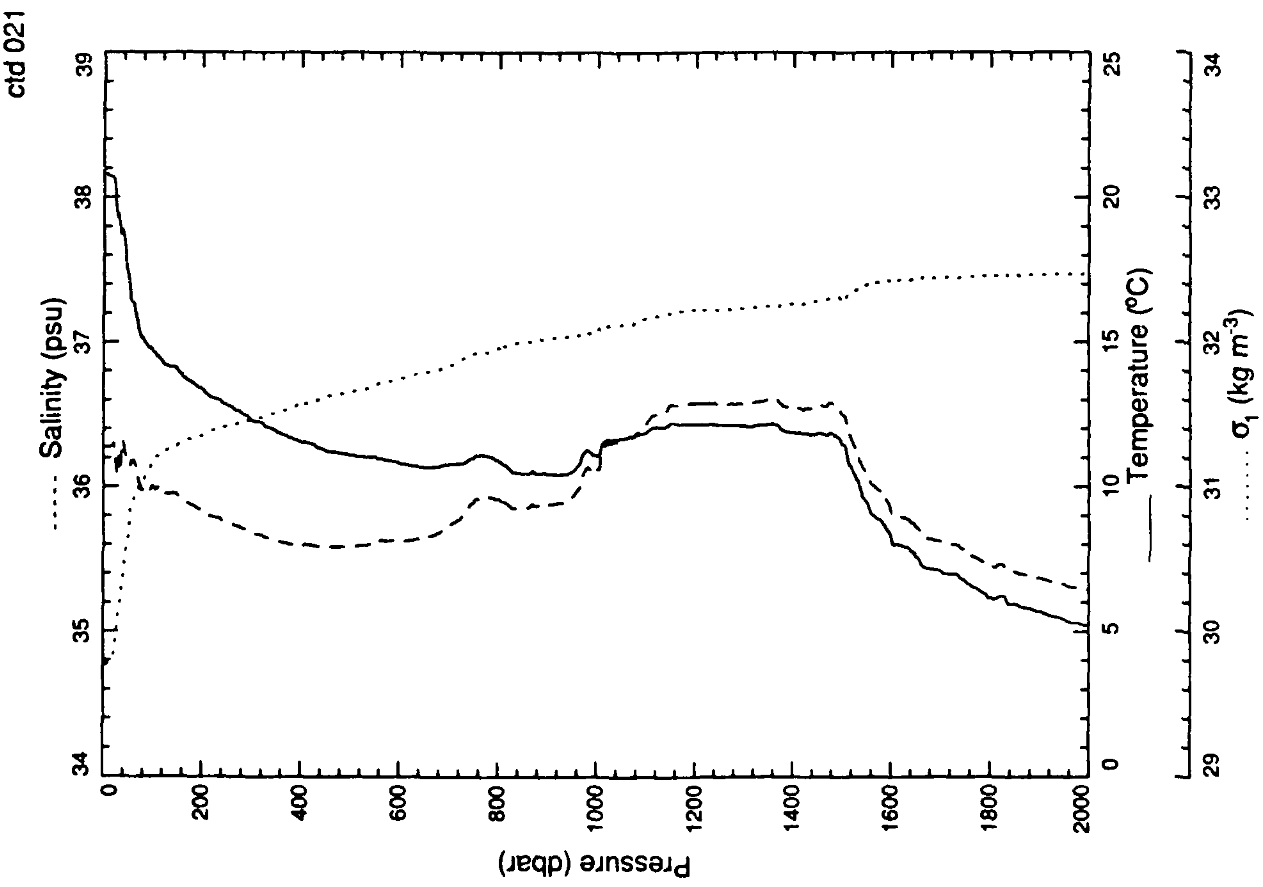

ctd 018
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

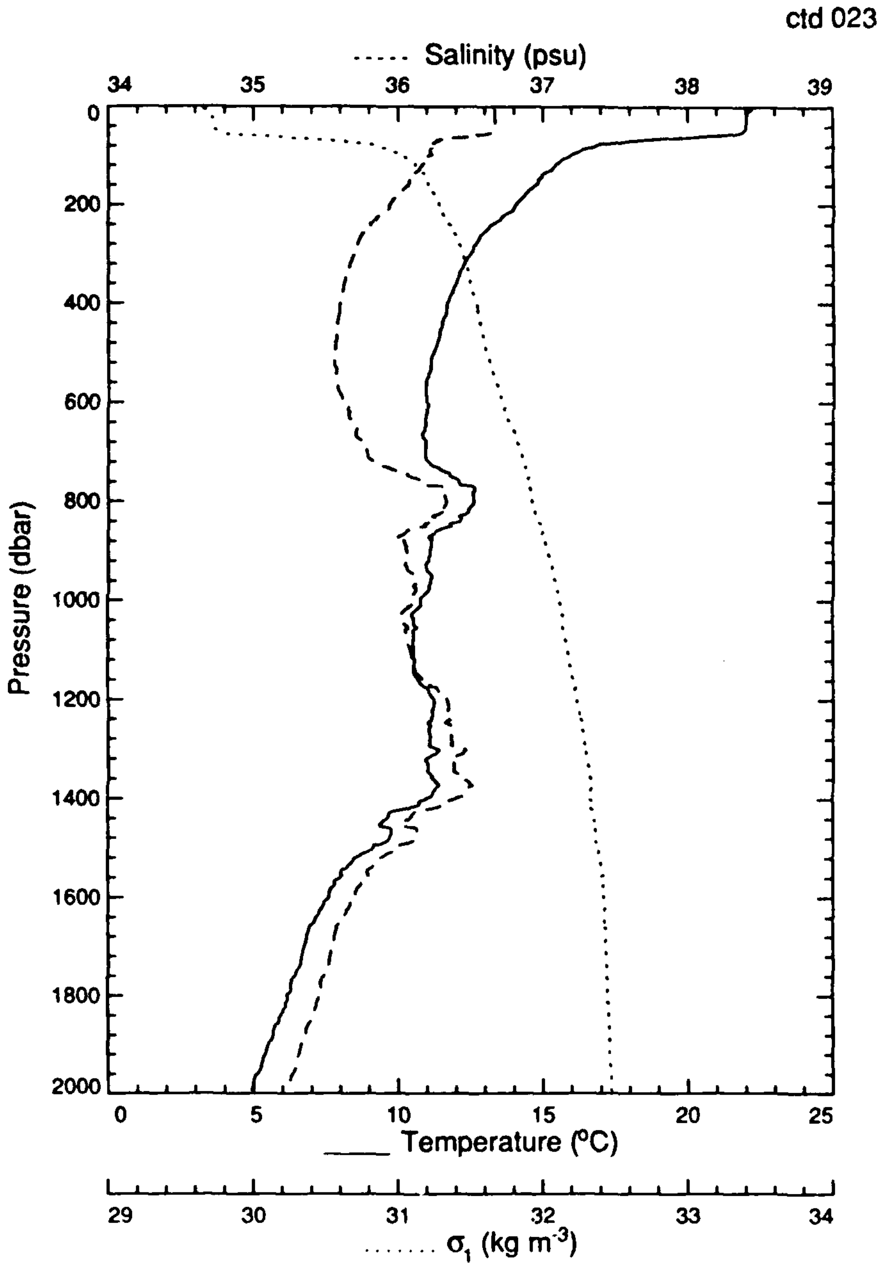

ctd 017
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)


ctd 020
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

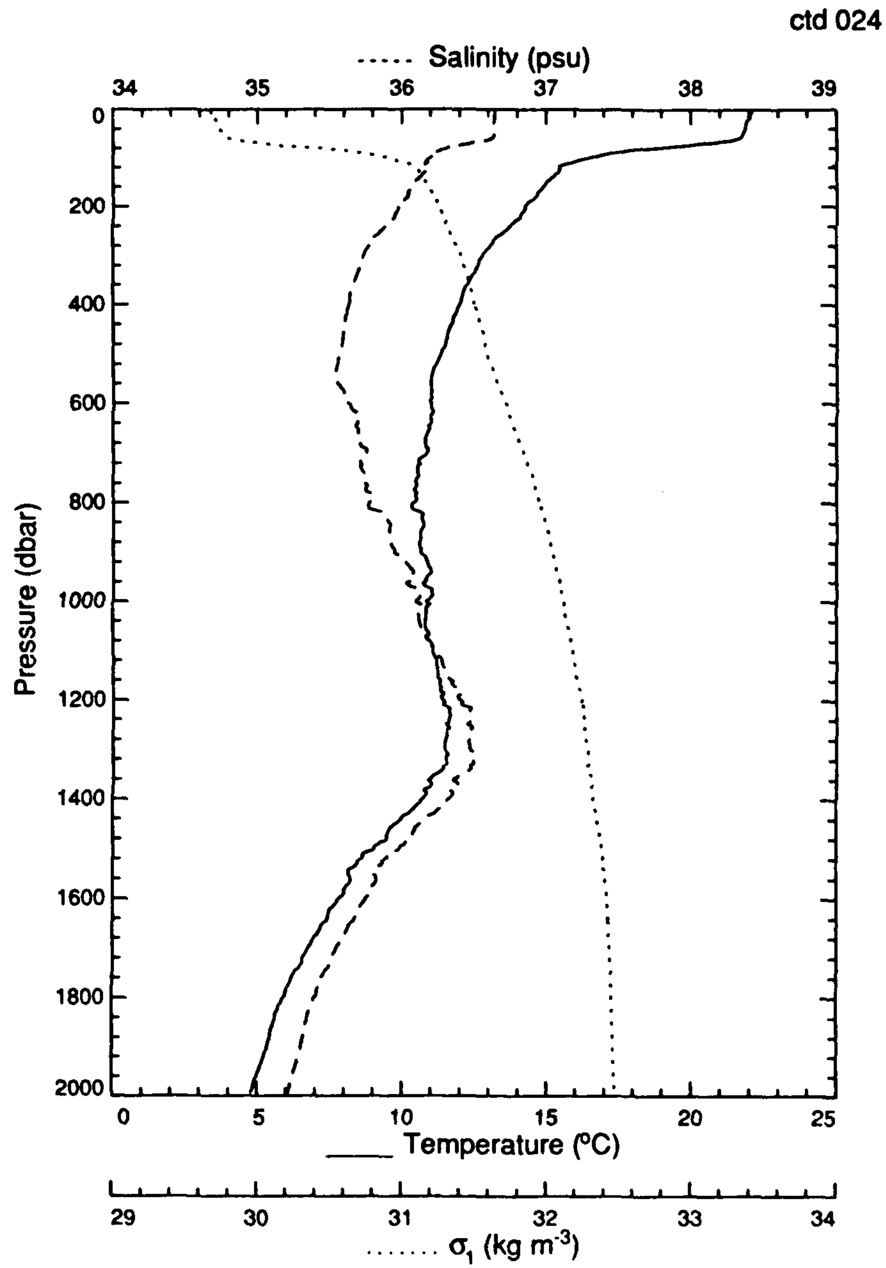

ctd 019
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)


ctd 022
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

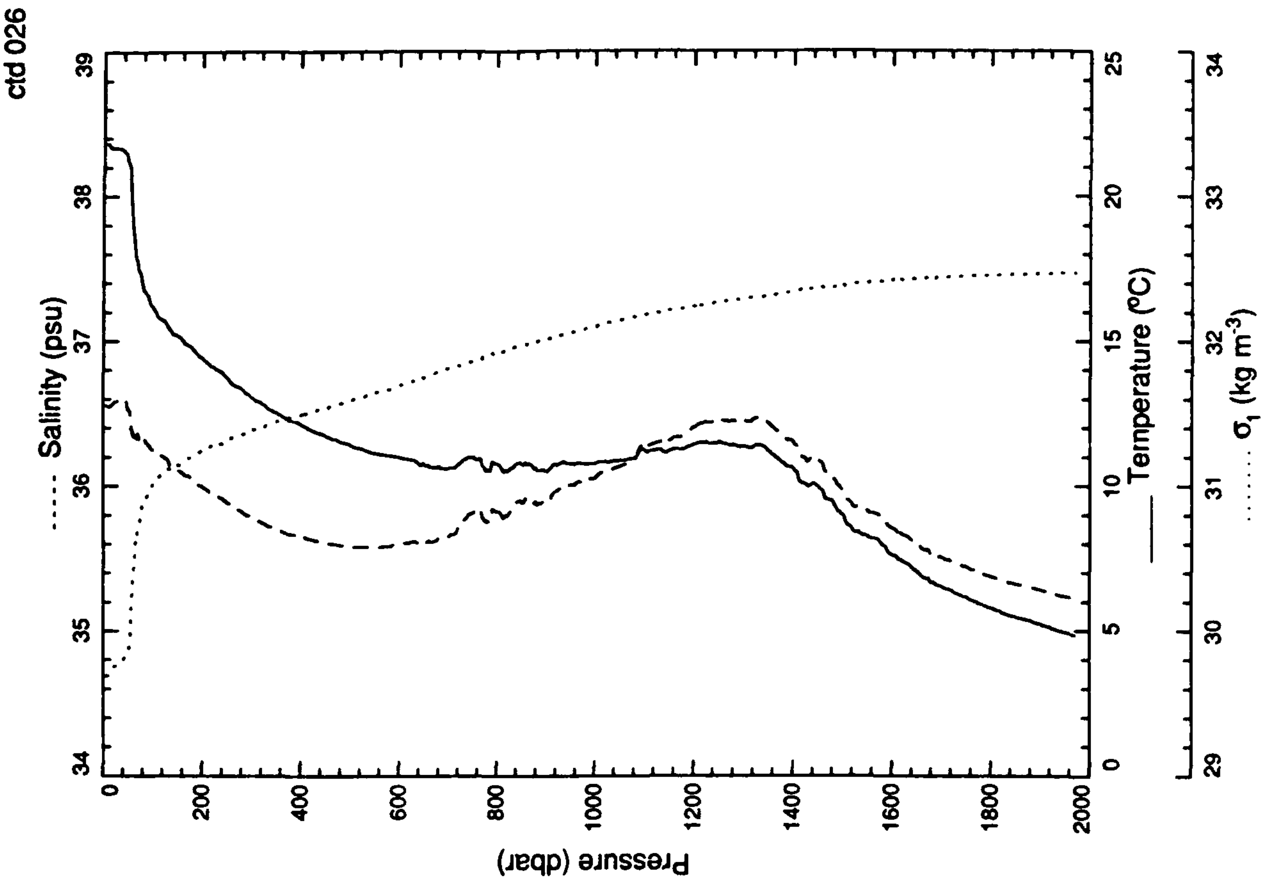

ctd 021
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000



ctd 023
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ_1 (kg m^{-3})



ctd 024
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ_1 (kg m^{-3})


ctd 026
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)
34
35
36
37
38
39
0
5
10
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34
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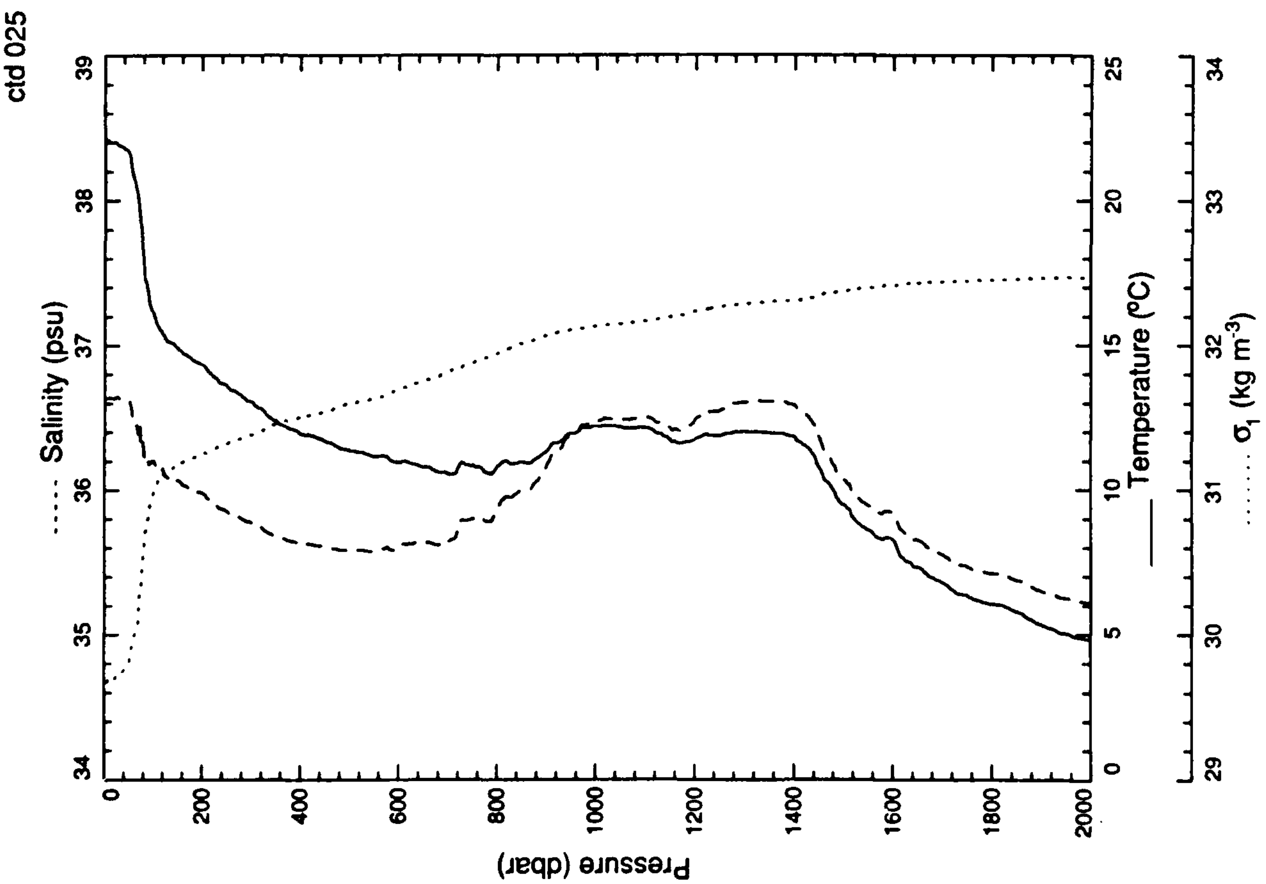
1200
1400
1600
1800
2000


ctd 025
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)
34
35
36
37
38
39
0
5
10
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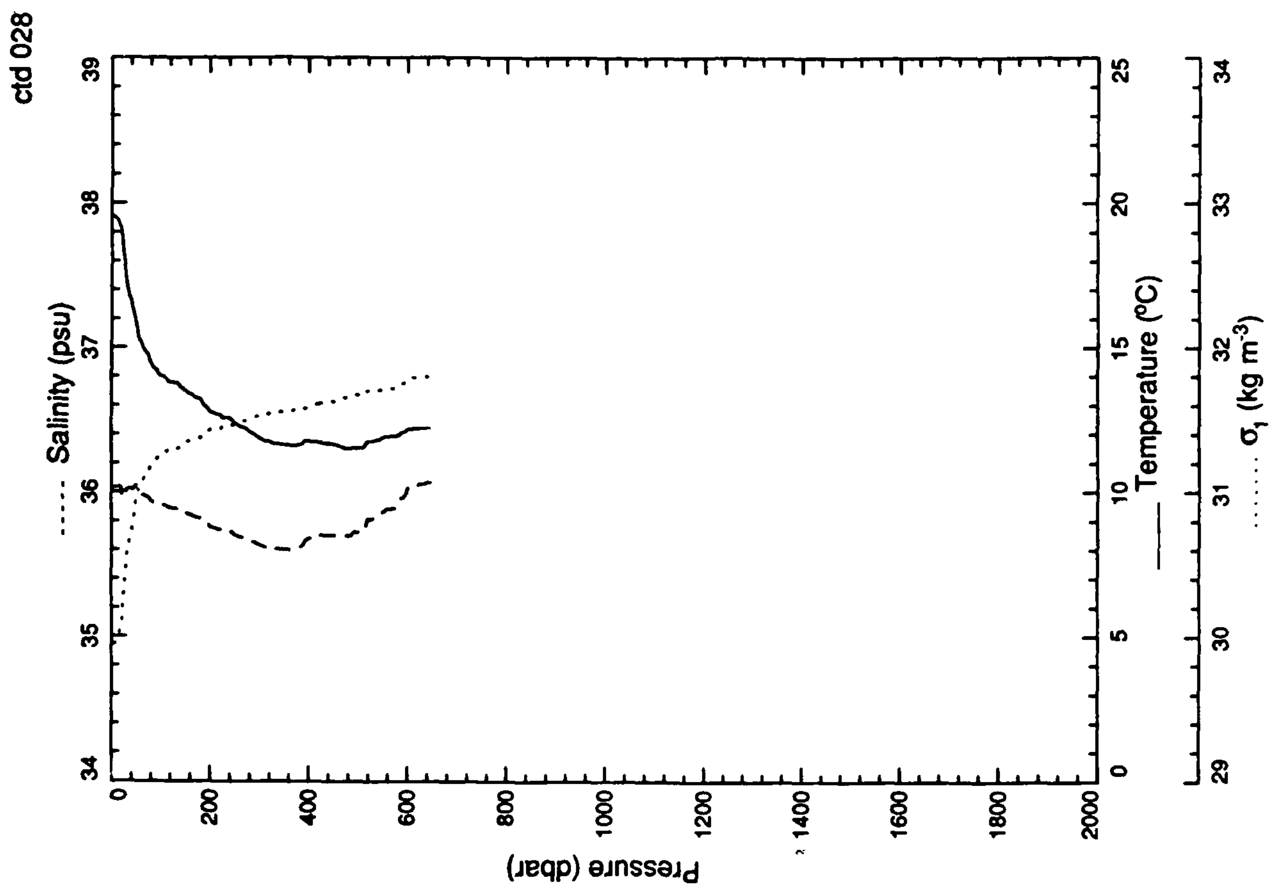
1200
1400
1600
1800
2000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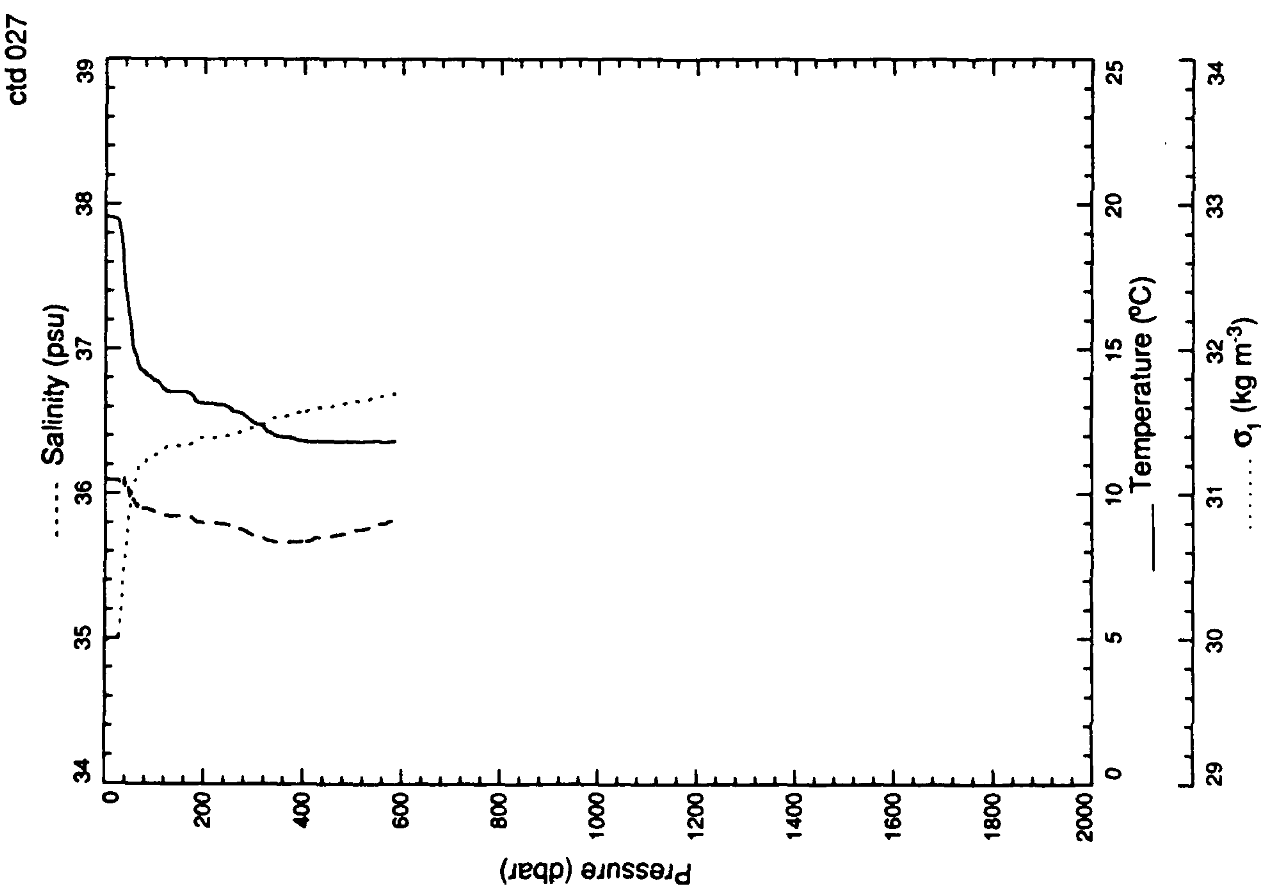
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)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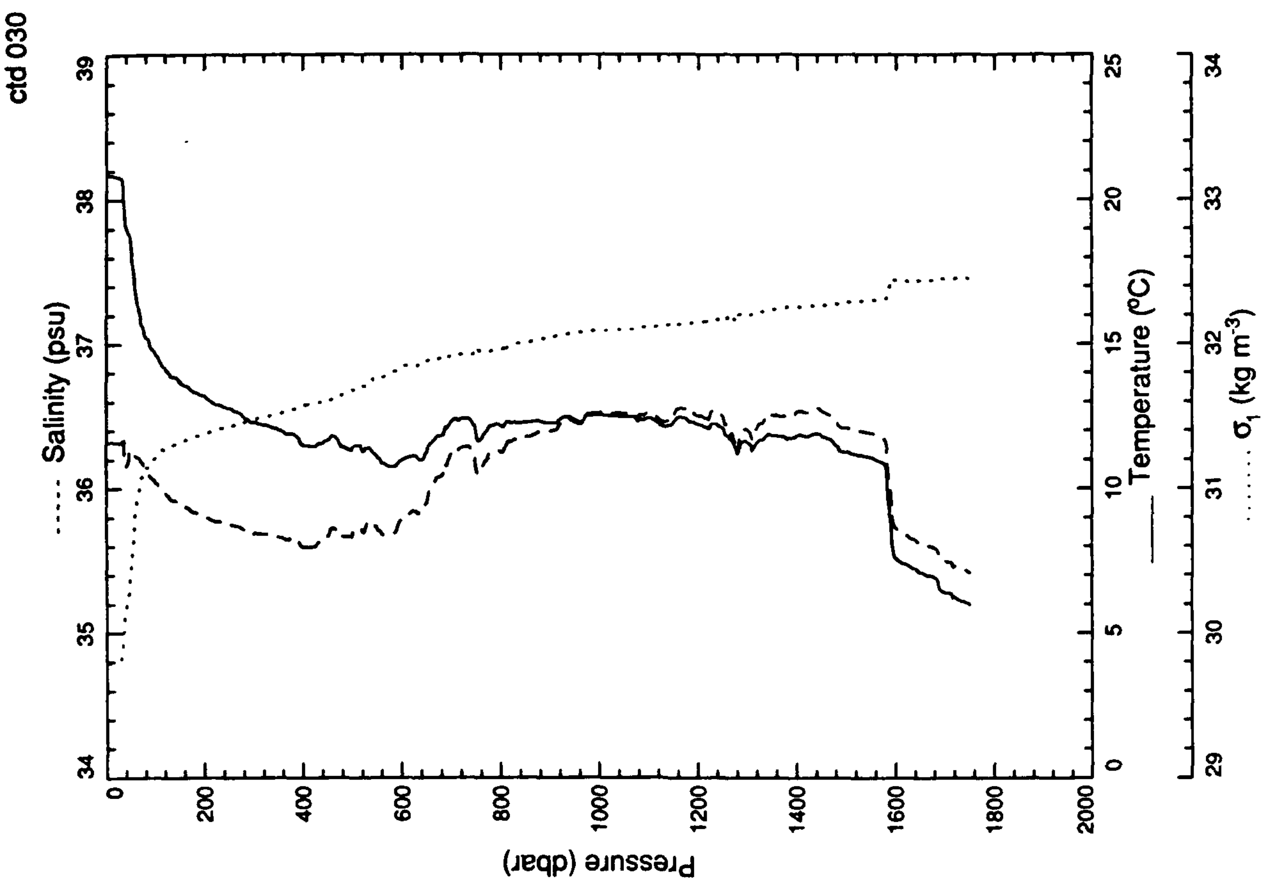
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)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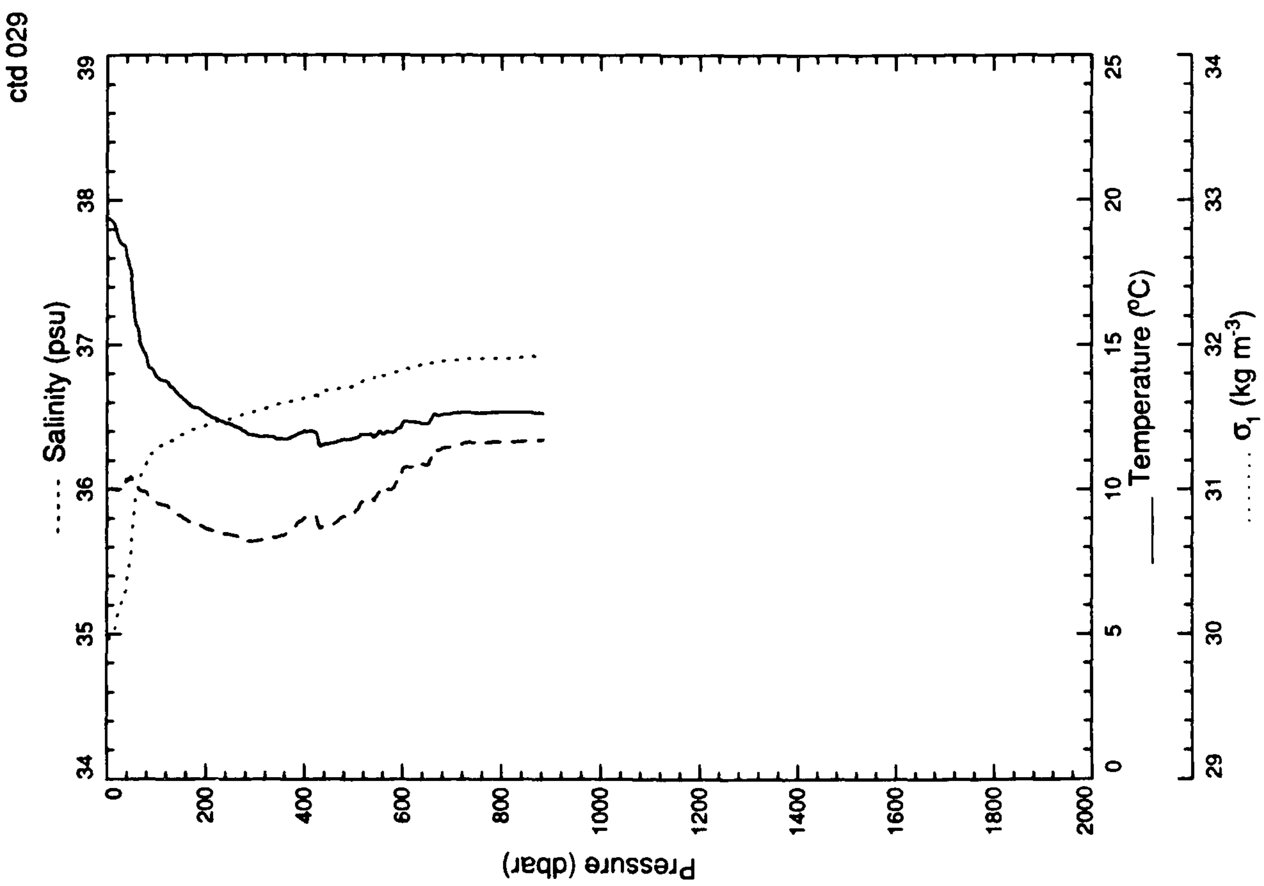
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)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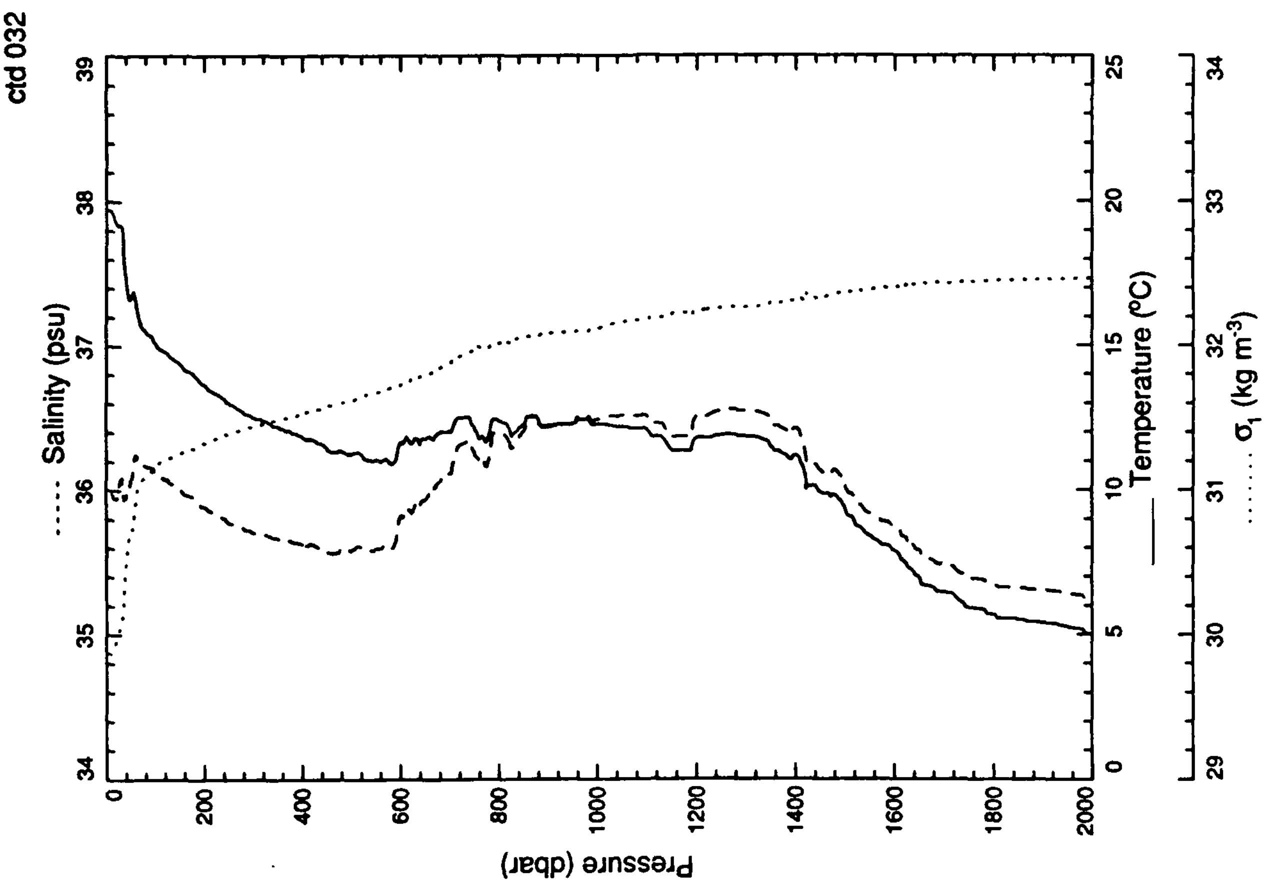
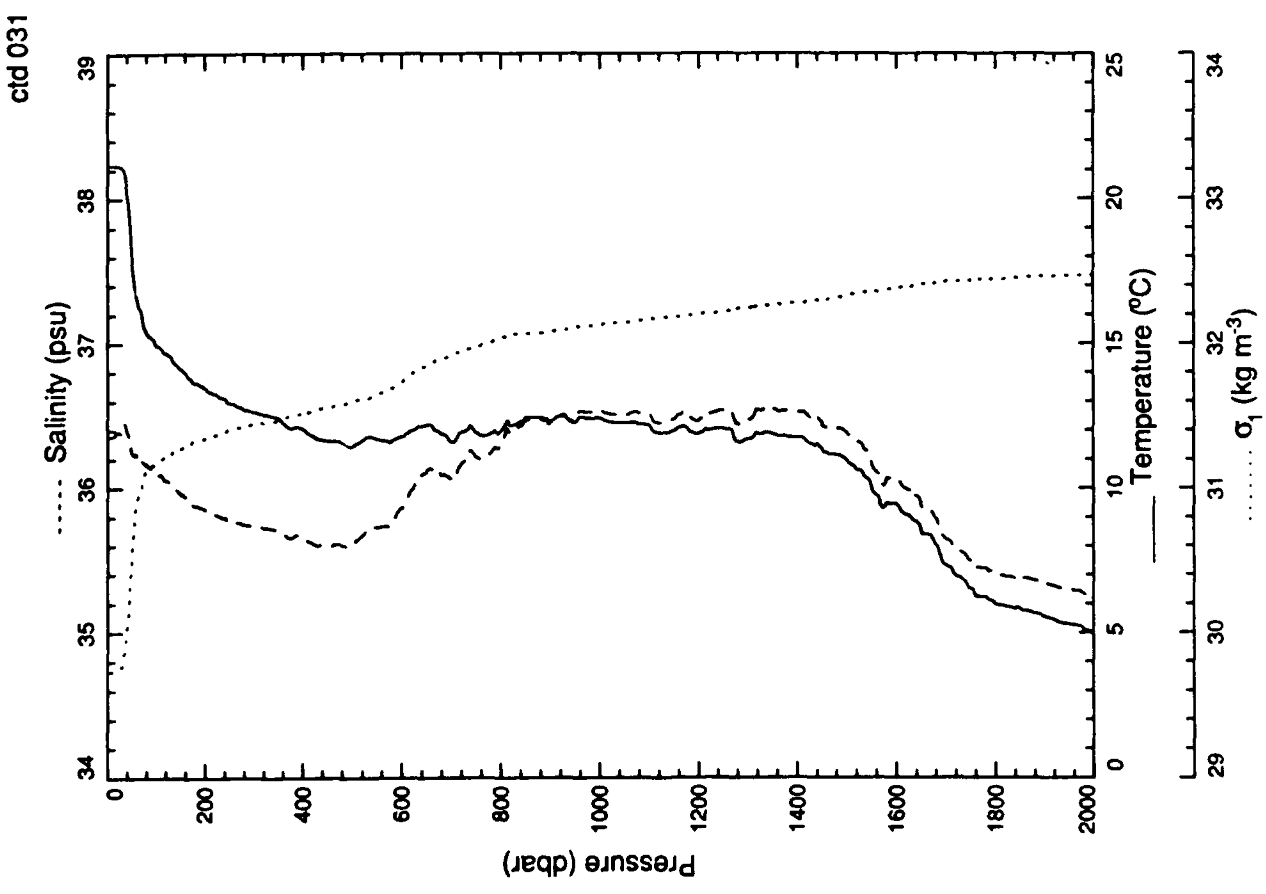
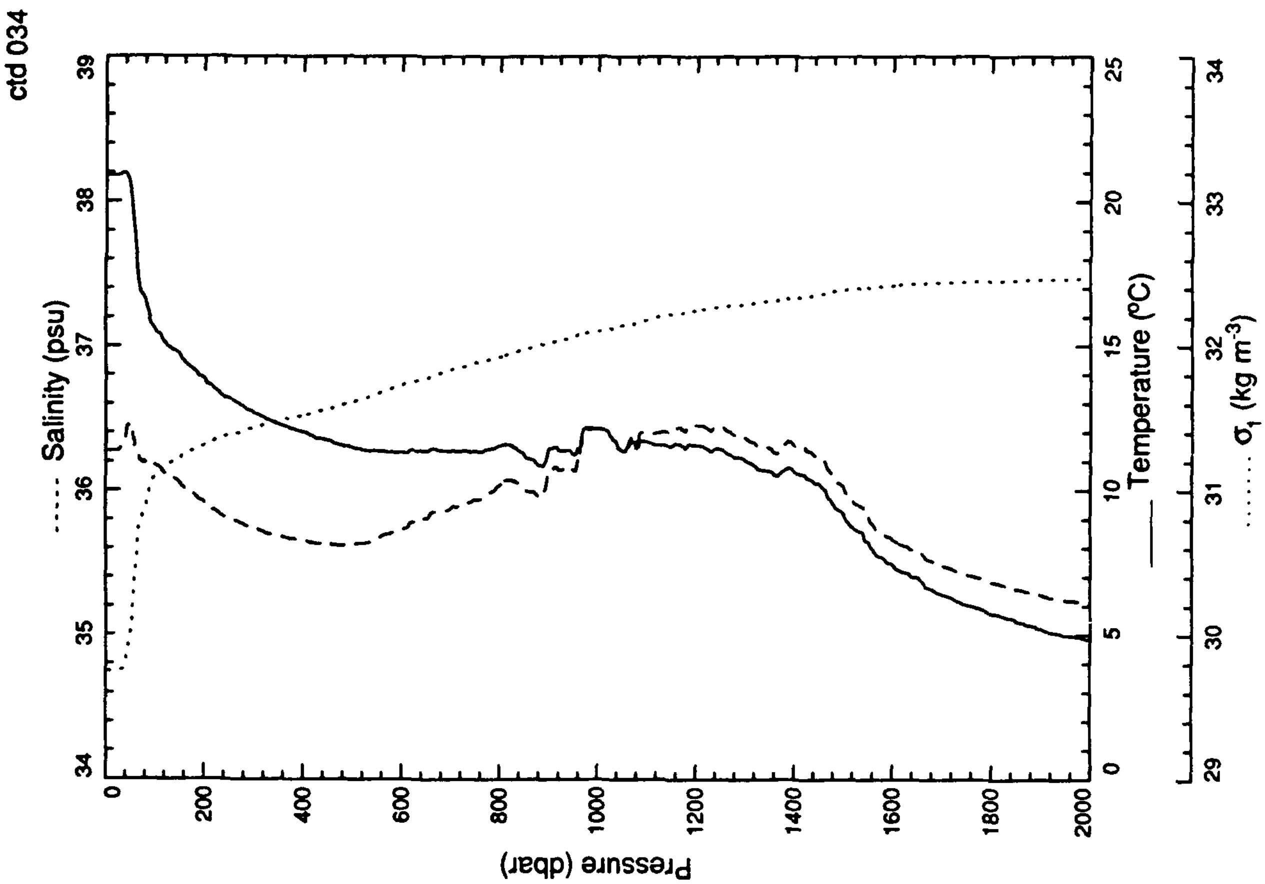
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)


ctd 032
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000


ctd 031
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000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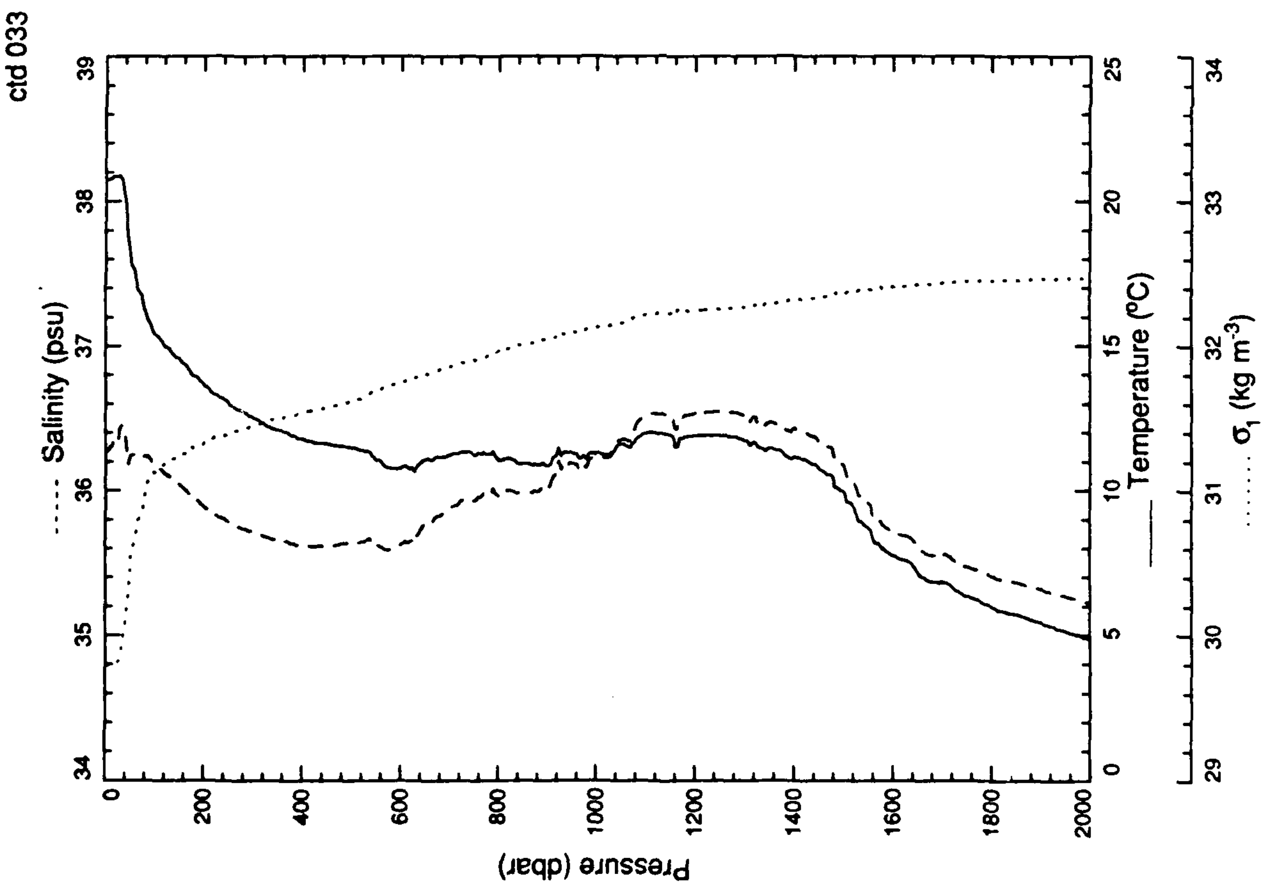
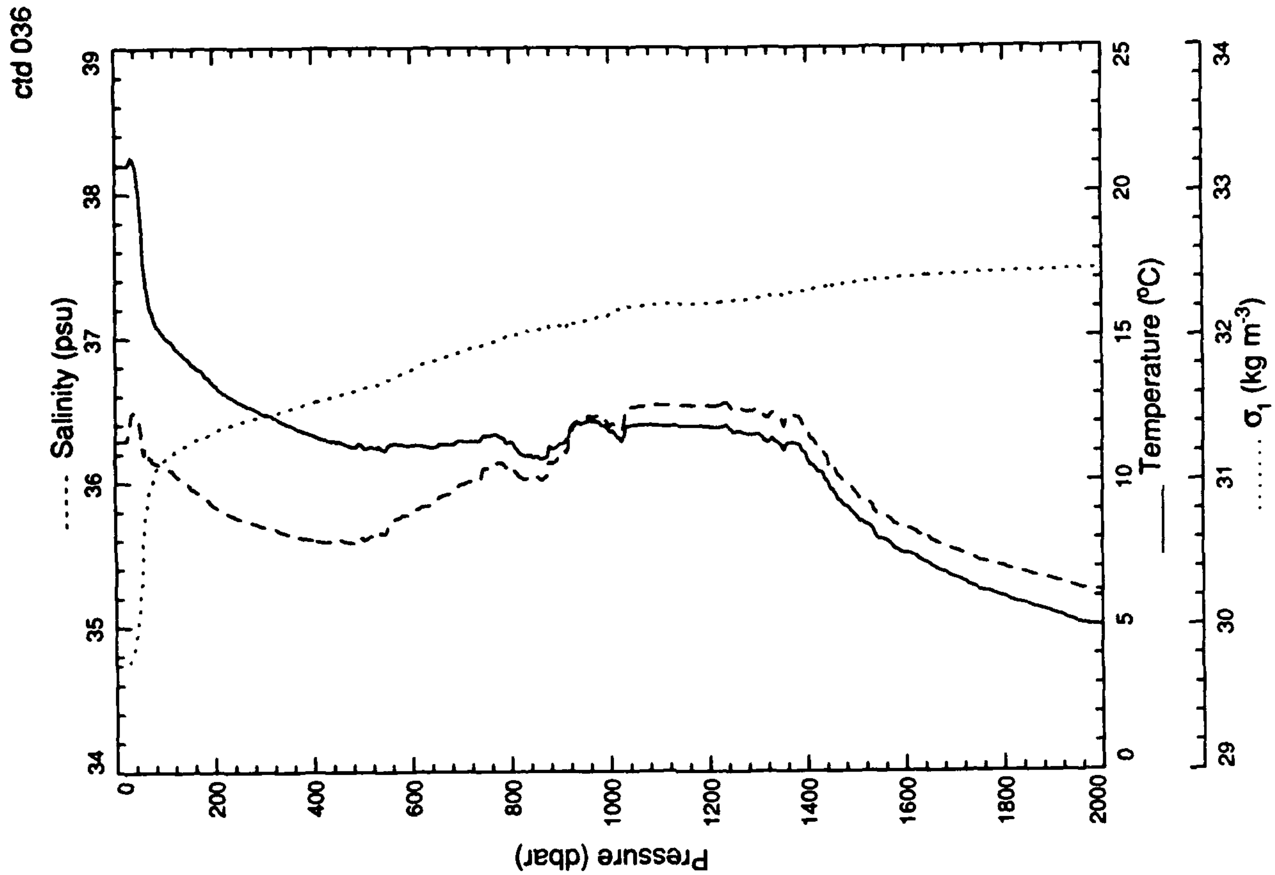
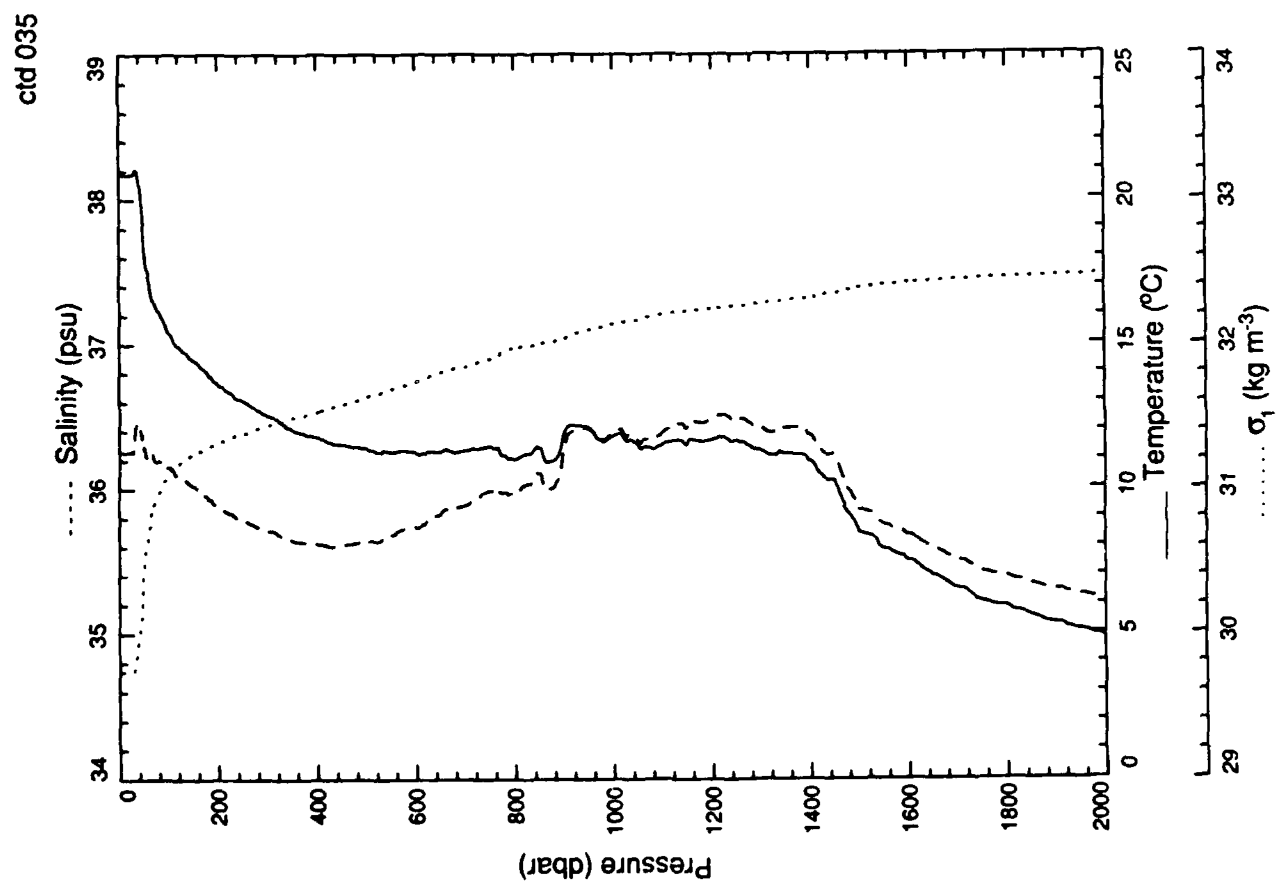
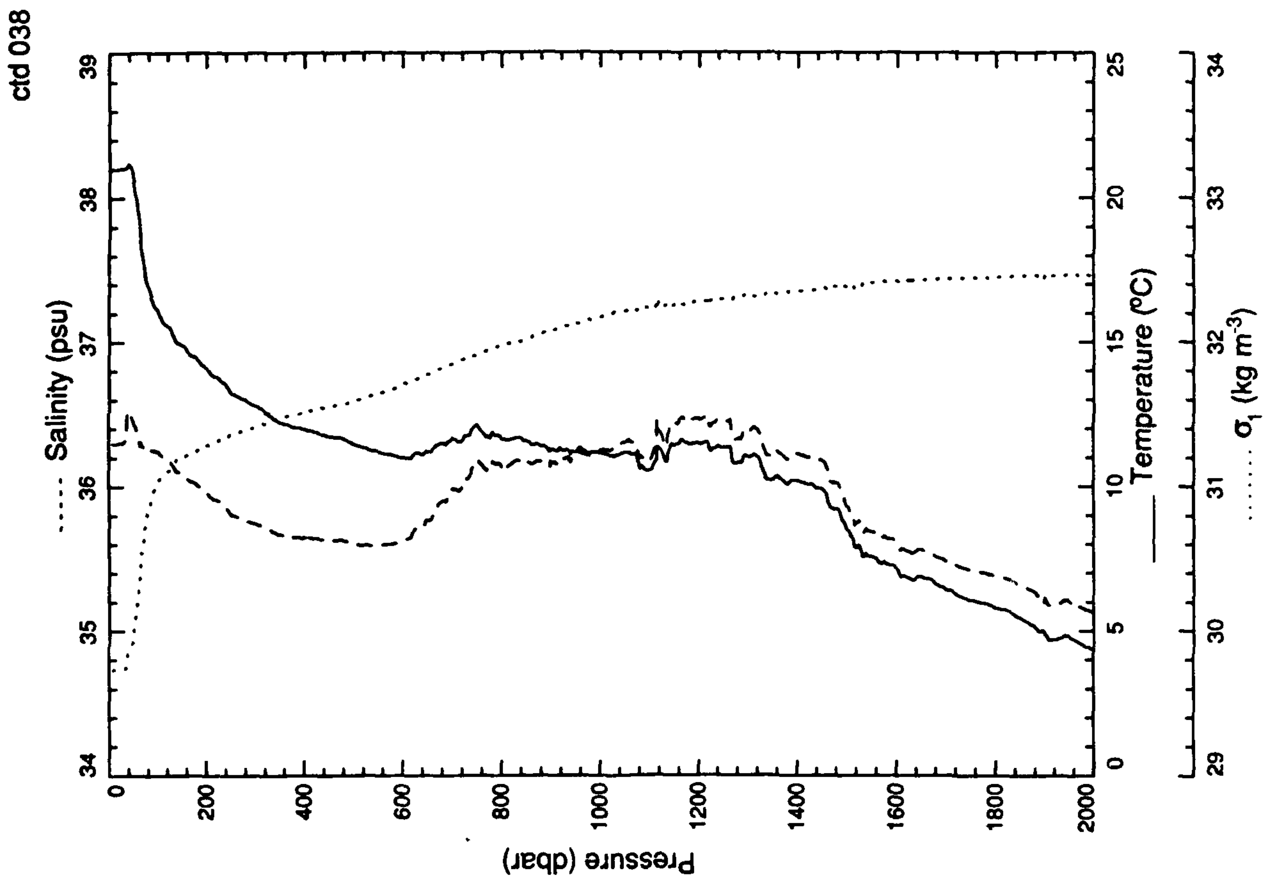
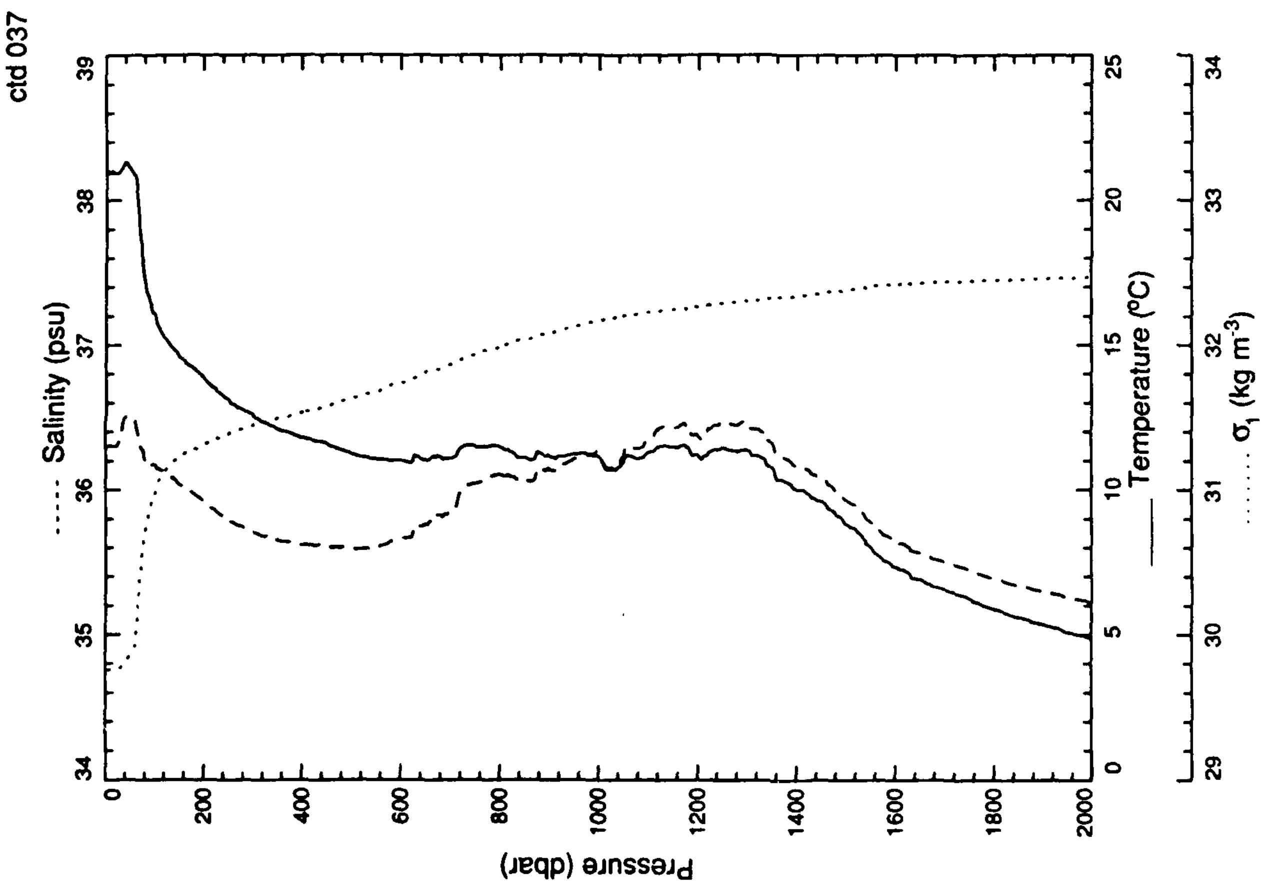
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

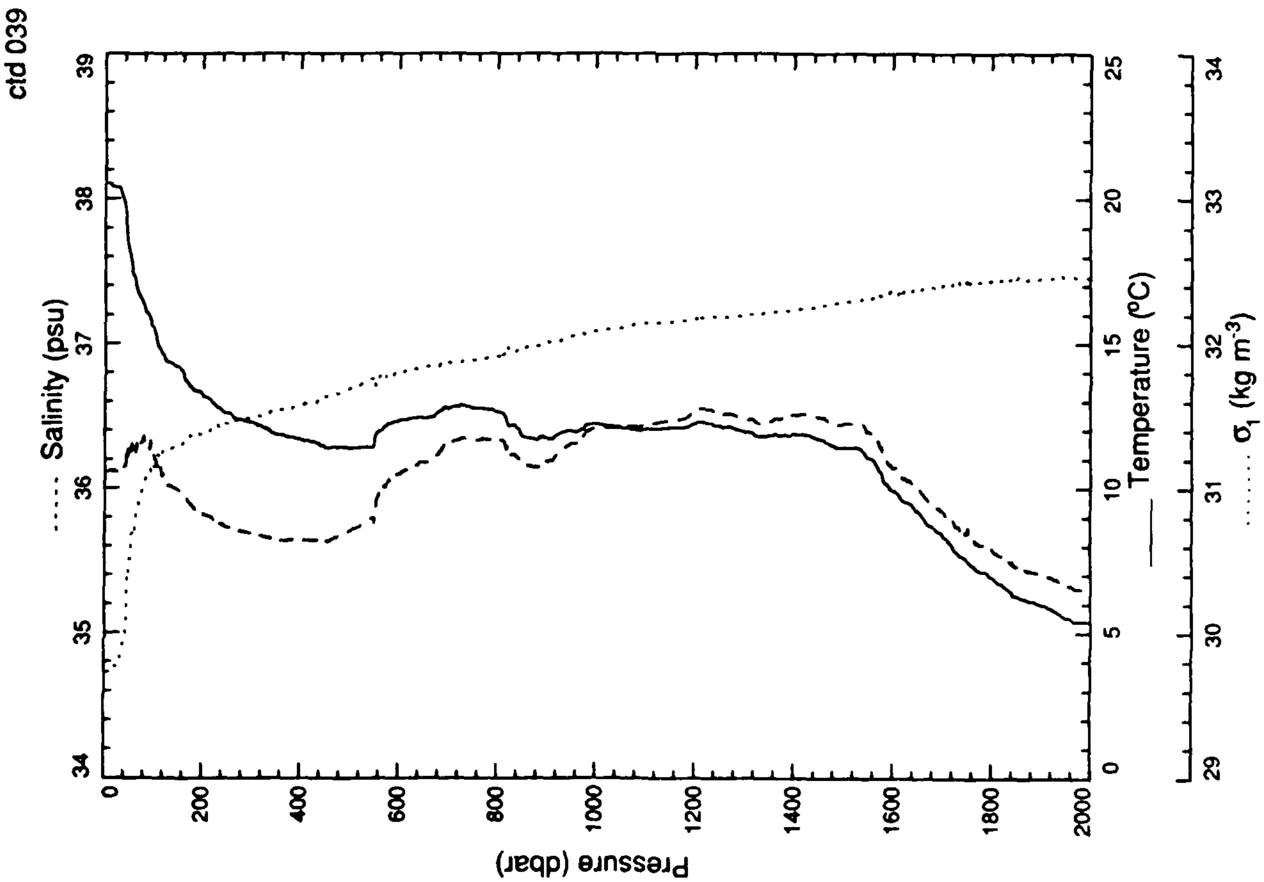

ctd 033
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

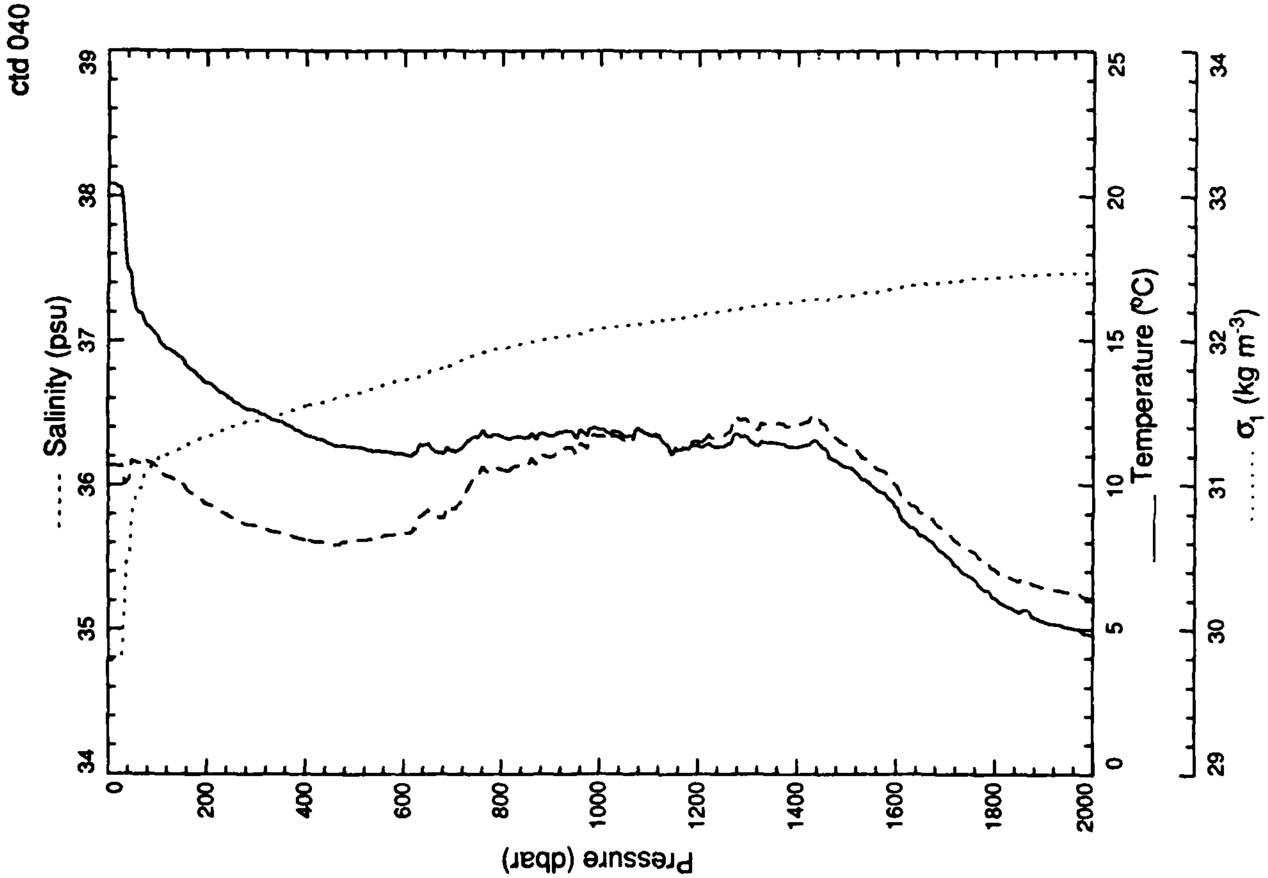

ctd 036
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)

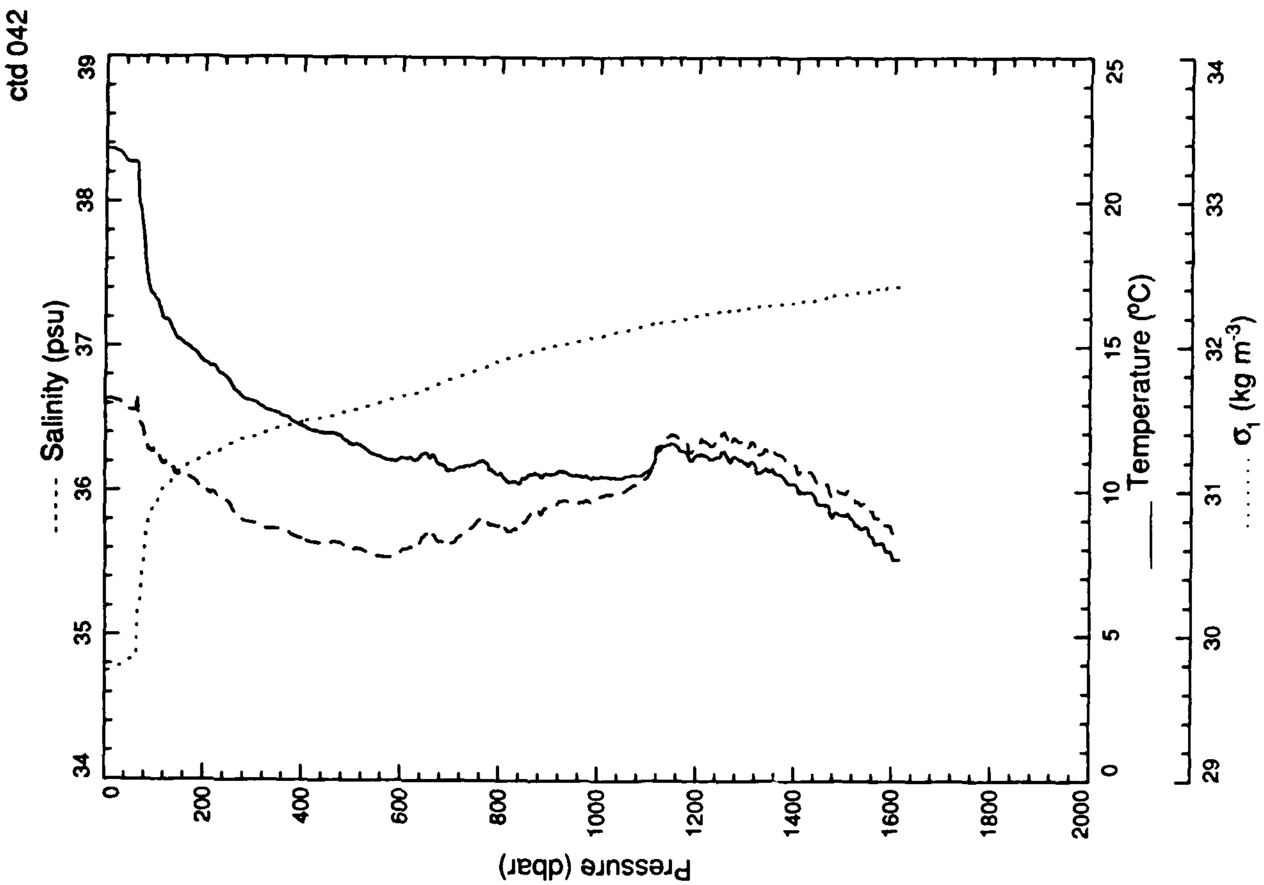

ctd 035
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)

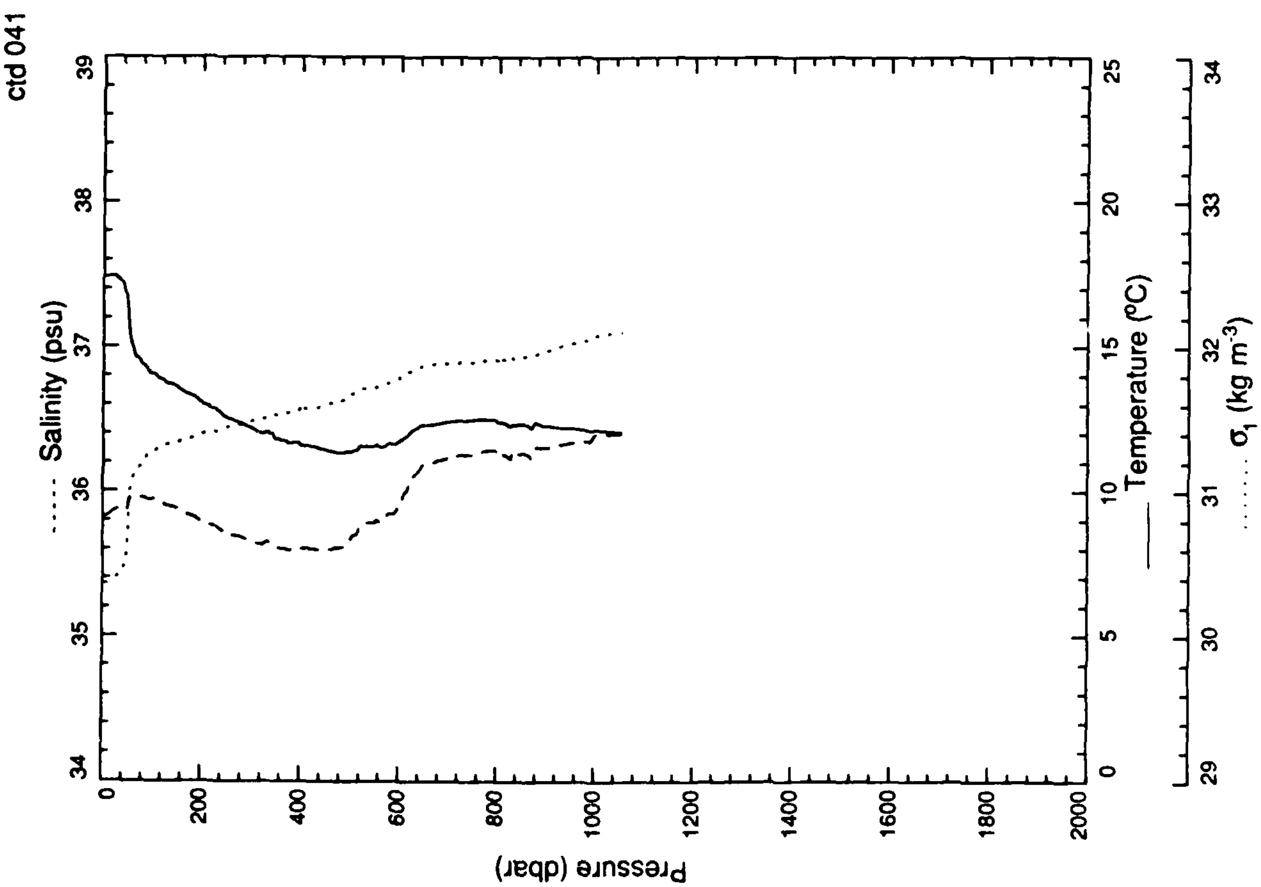

ctd 038
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

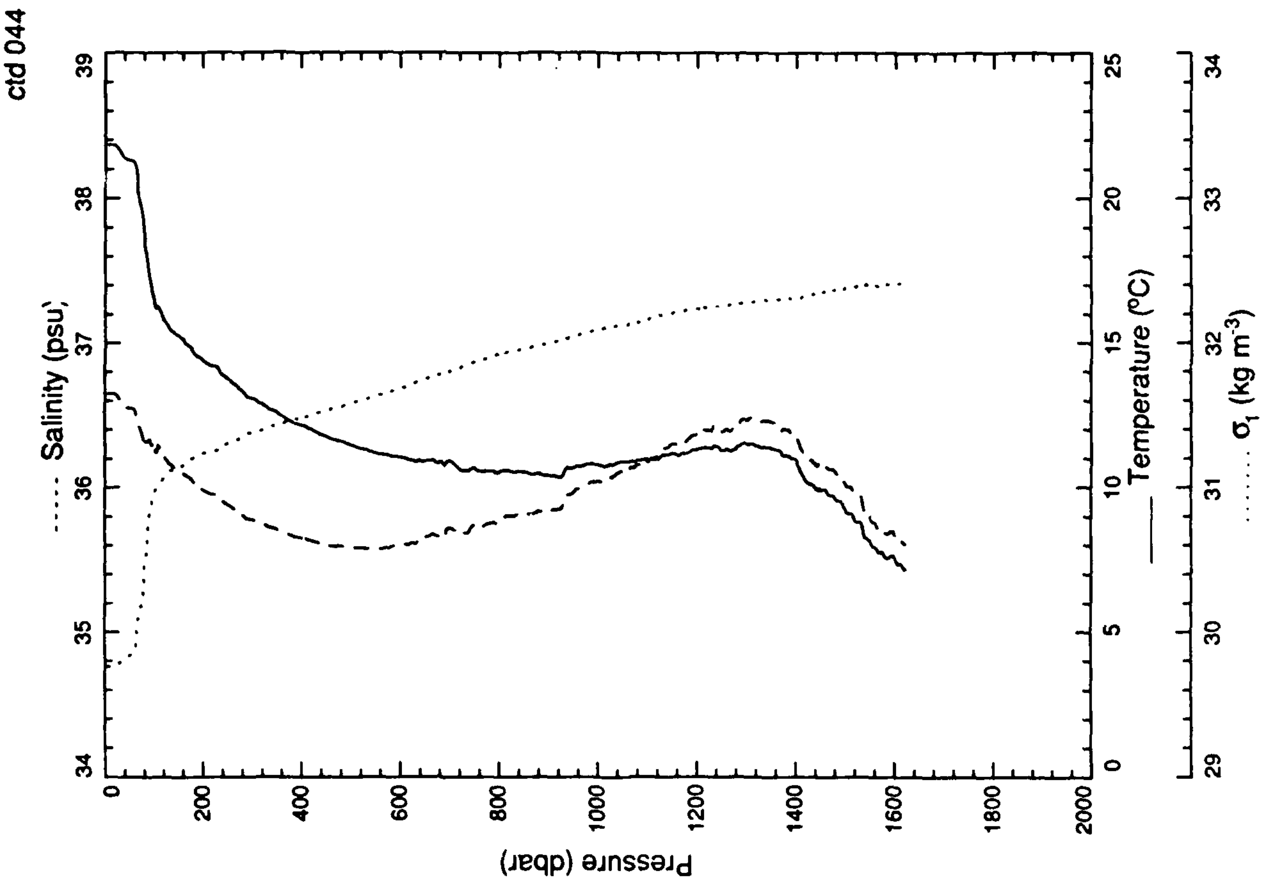

ctd 037
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

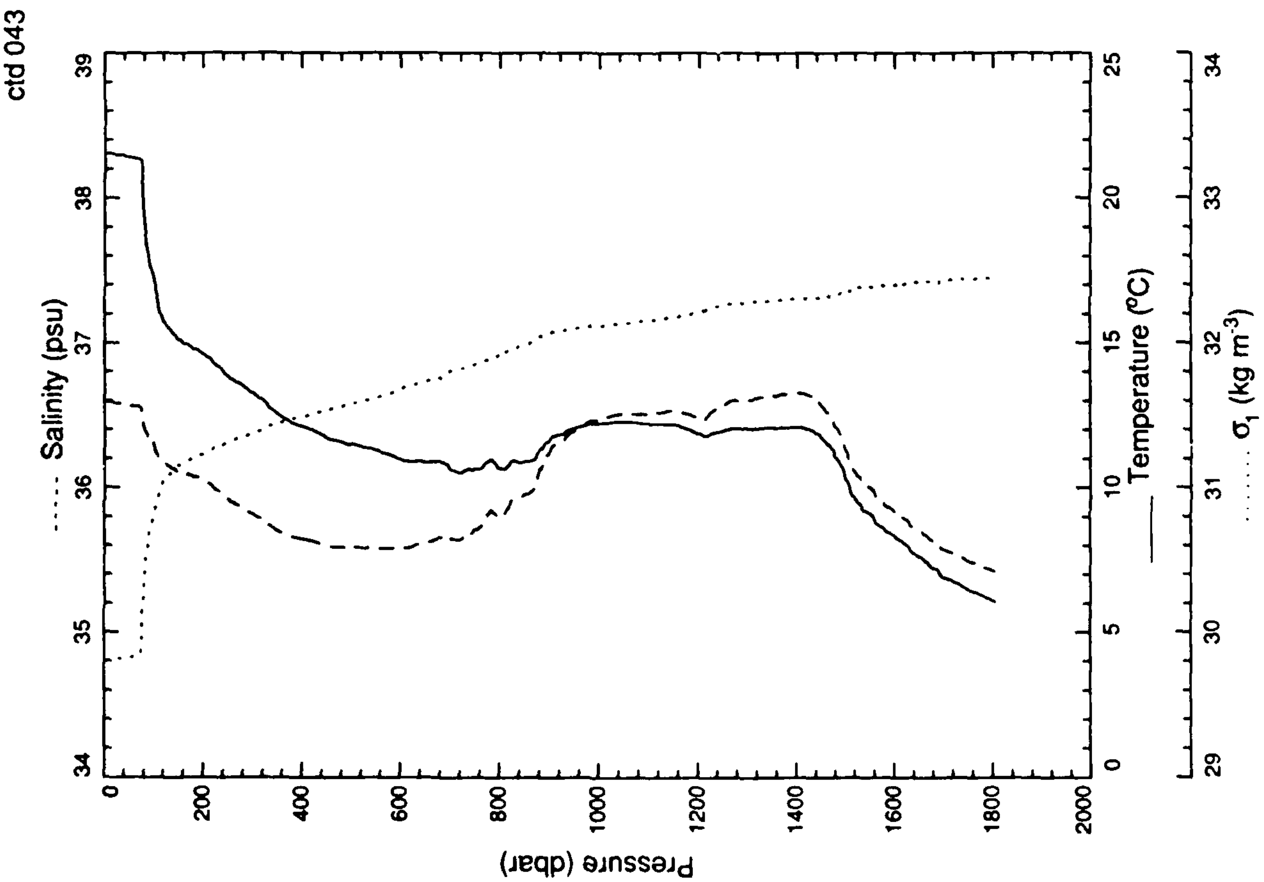

ctd 039
Salinity (psu)
Pressure (dbar)
Temperature (ºC)
σ_1 (kg m^{-3})

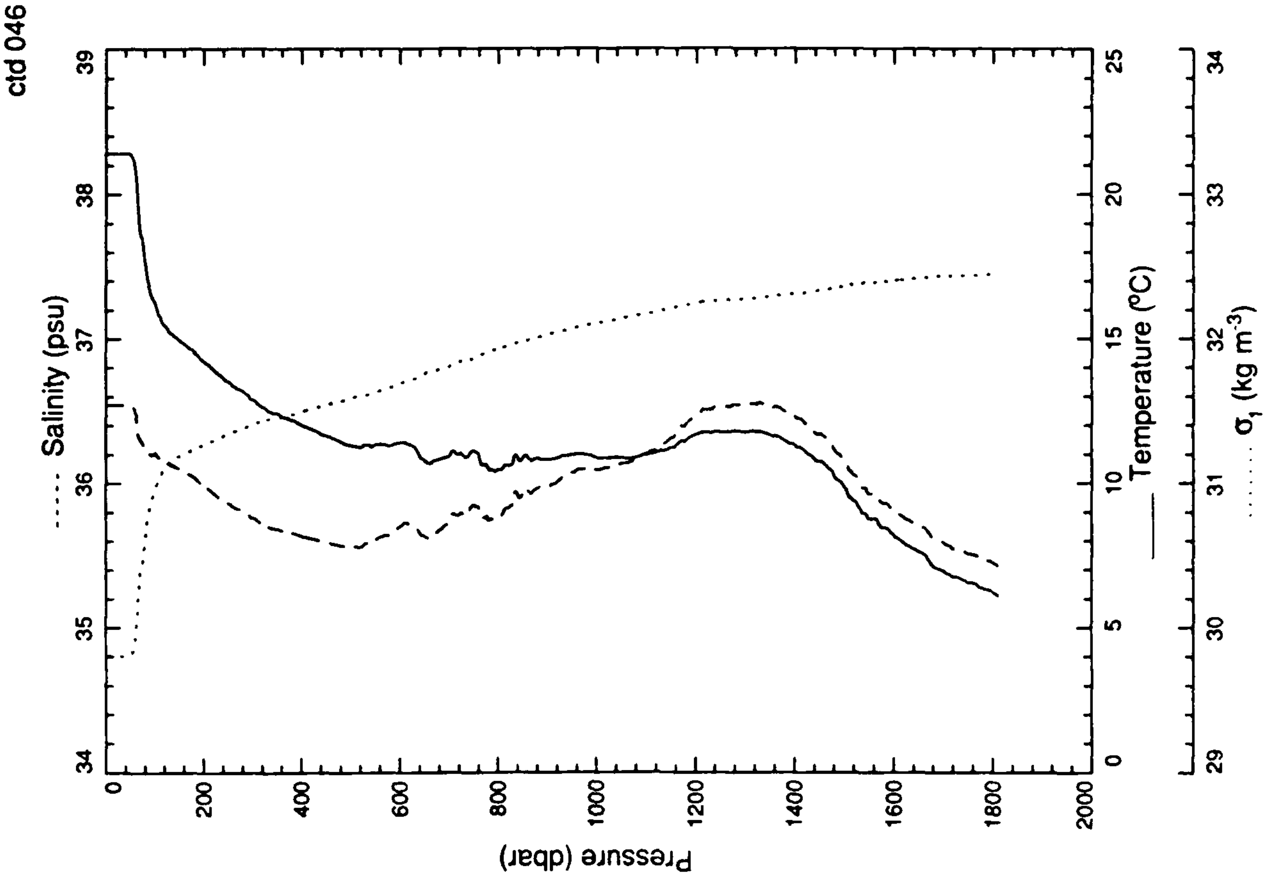

ctd 040
Salinity (psu)
Pressure (dbar)
Temperature (ºC)
σ_1 (kg m^{-3})

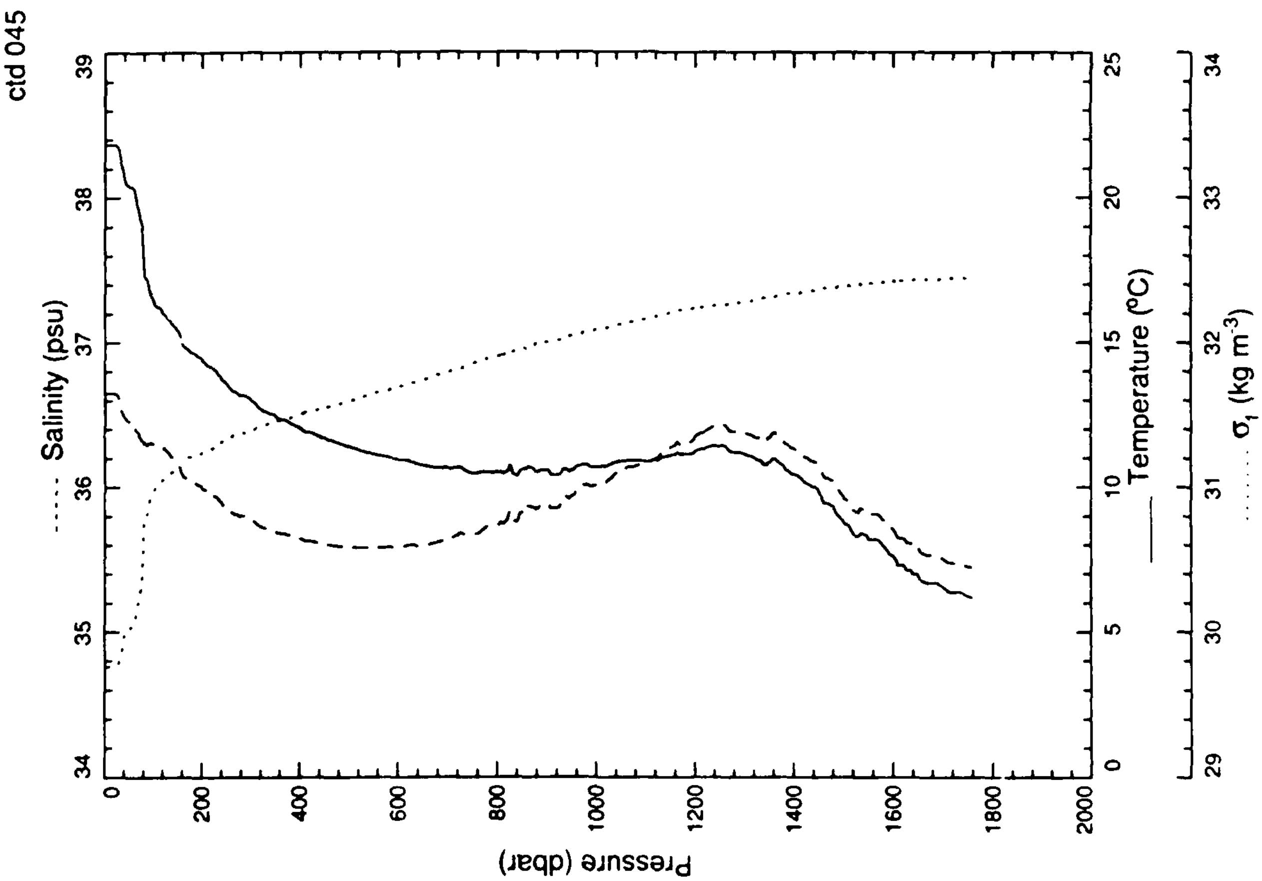

ctd 042
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

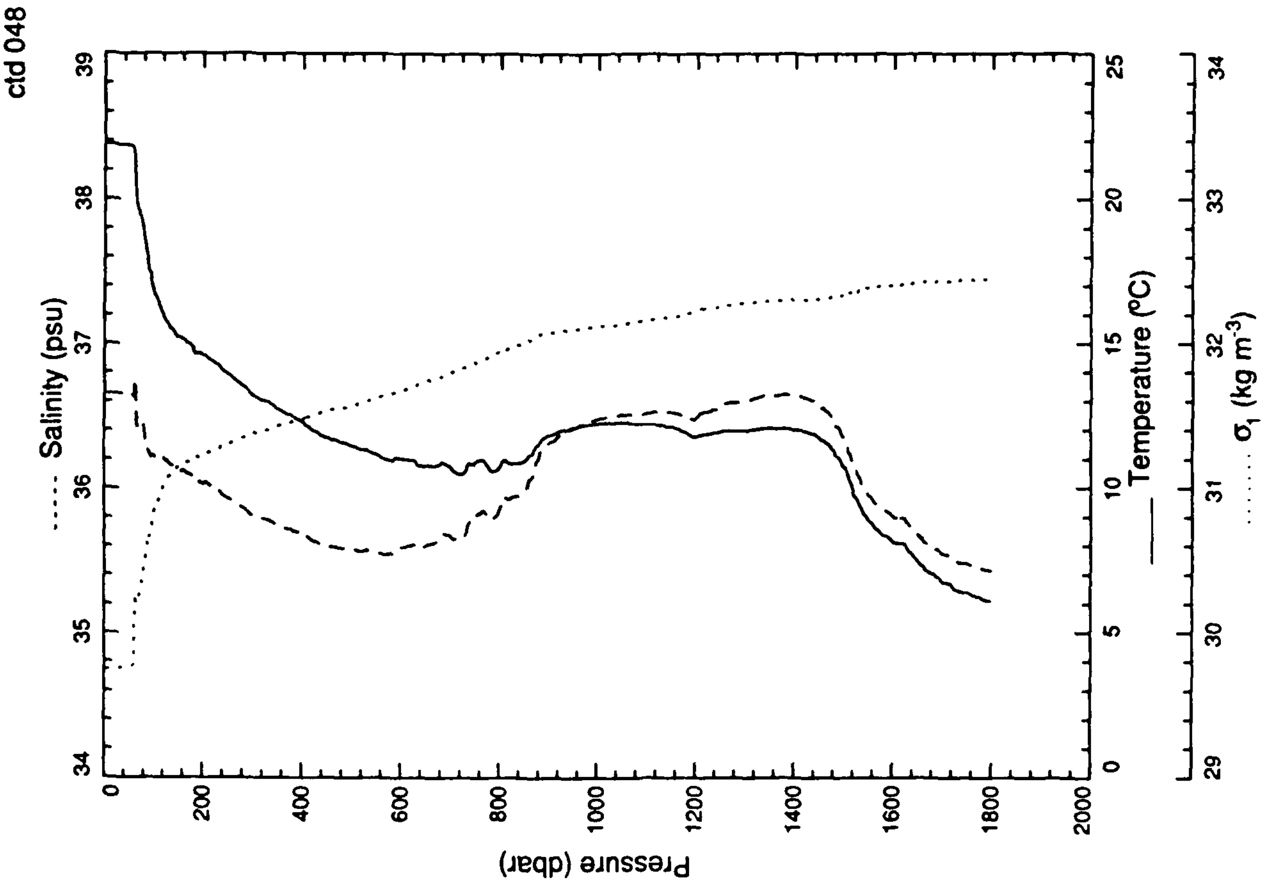

ctd 041
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

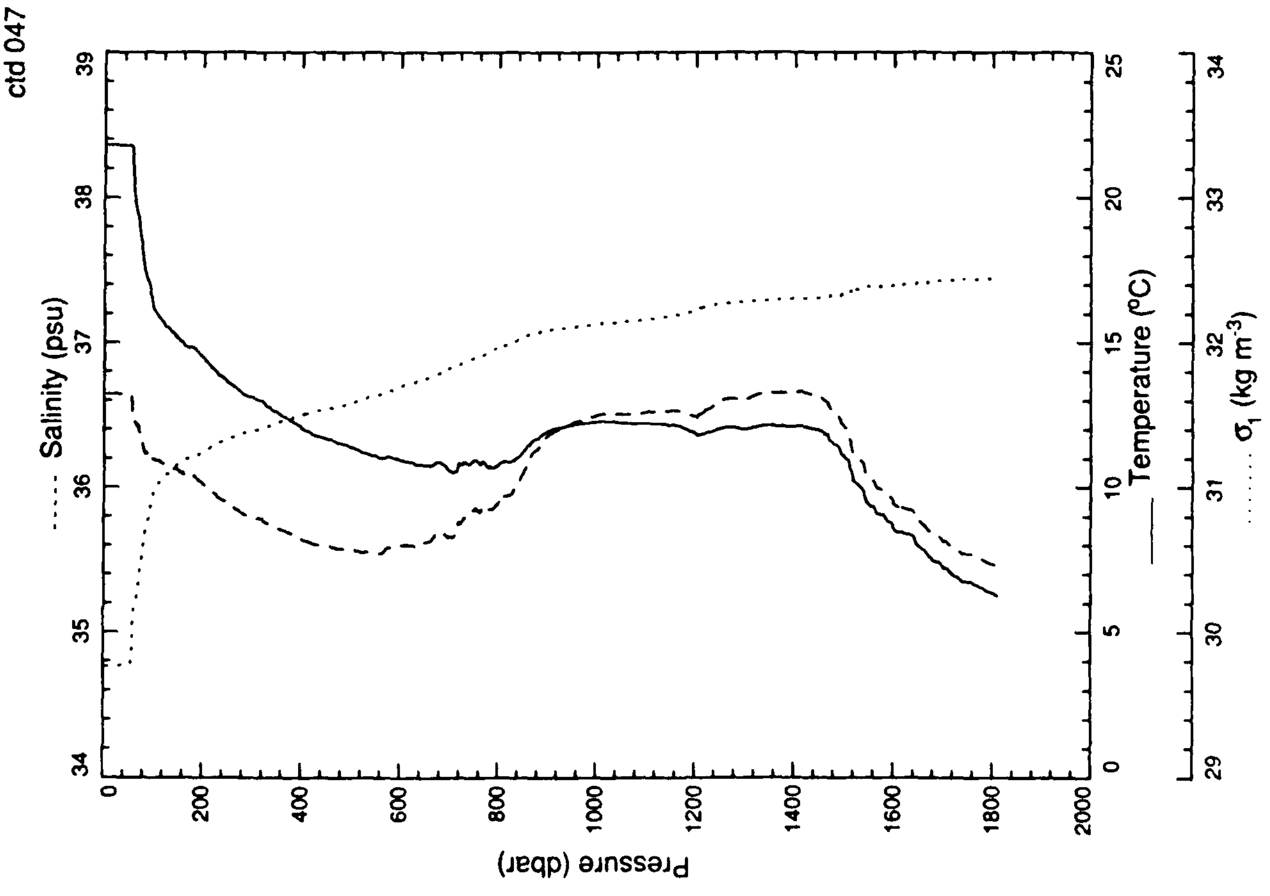

ctd 044
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

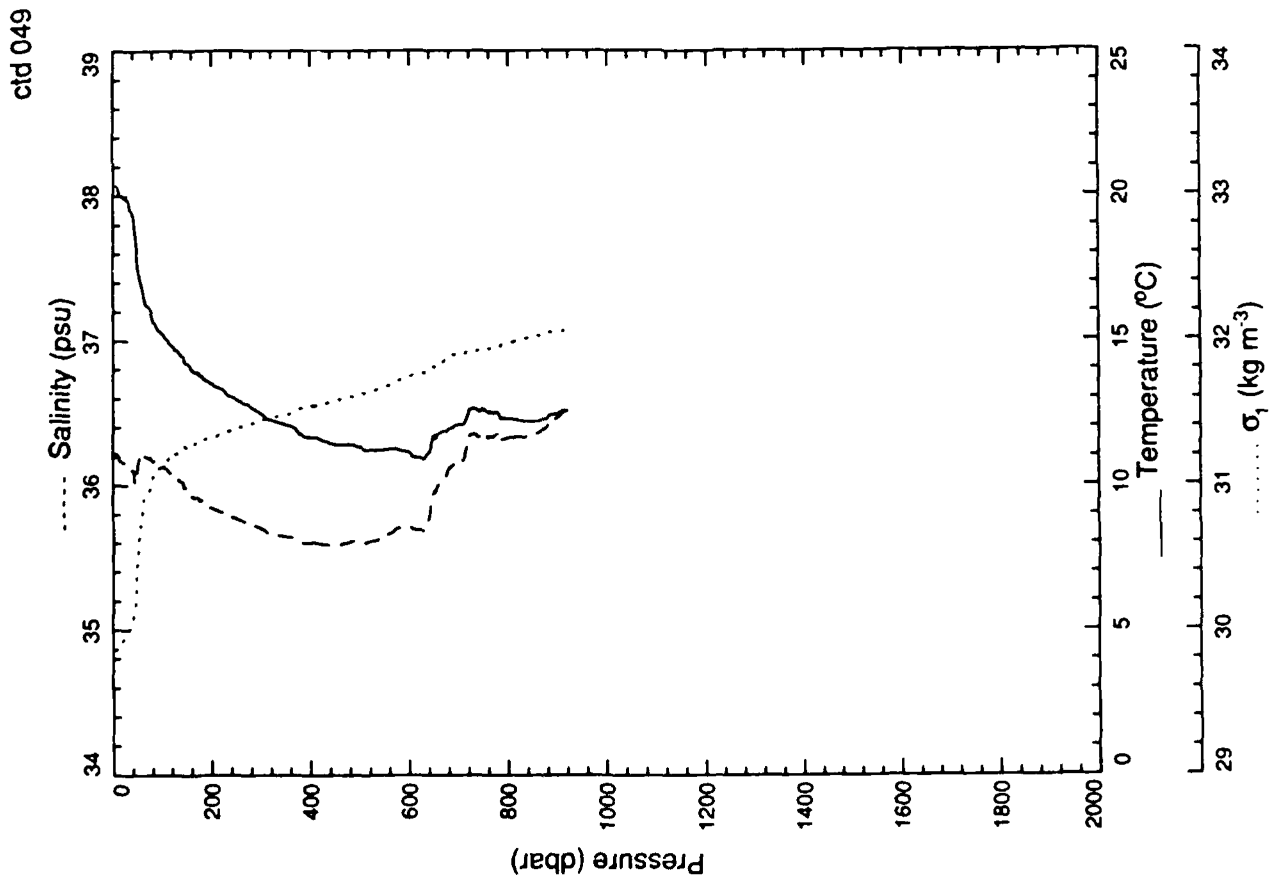

ctd 043
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

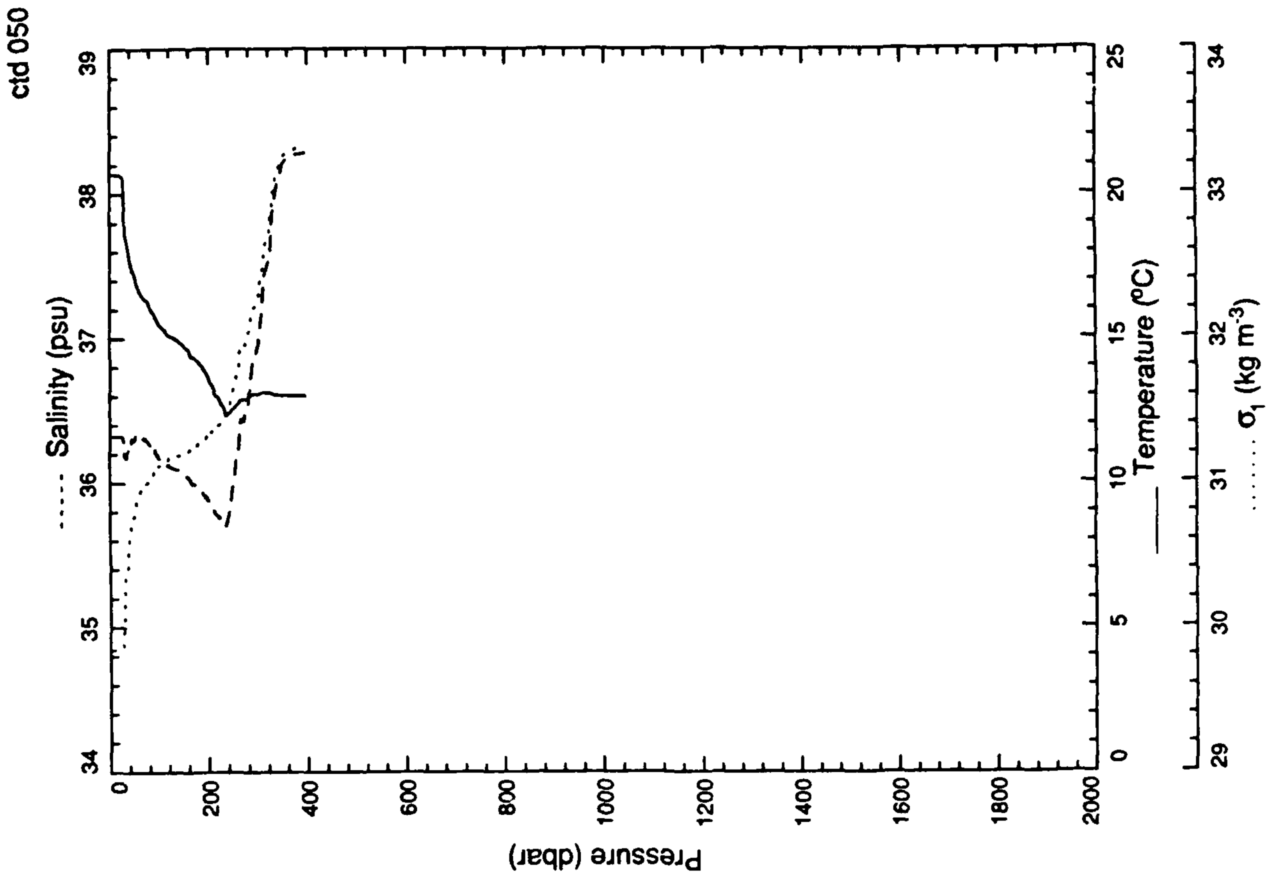

ctd 046
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

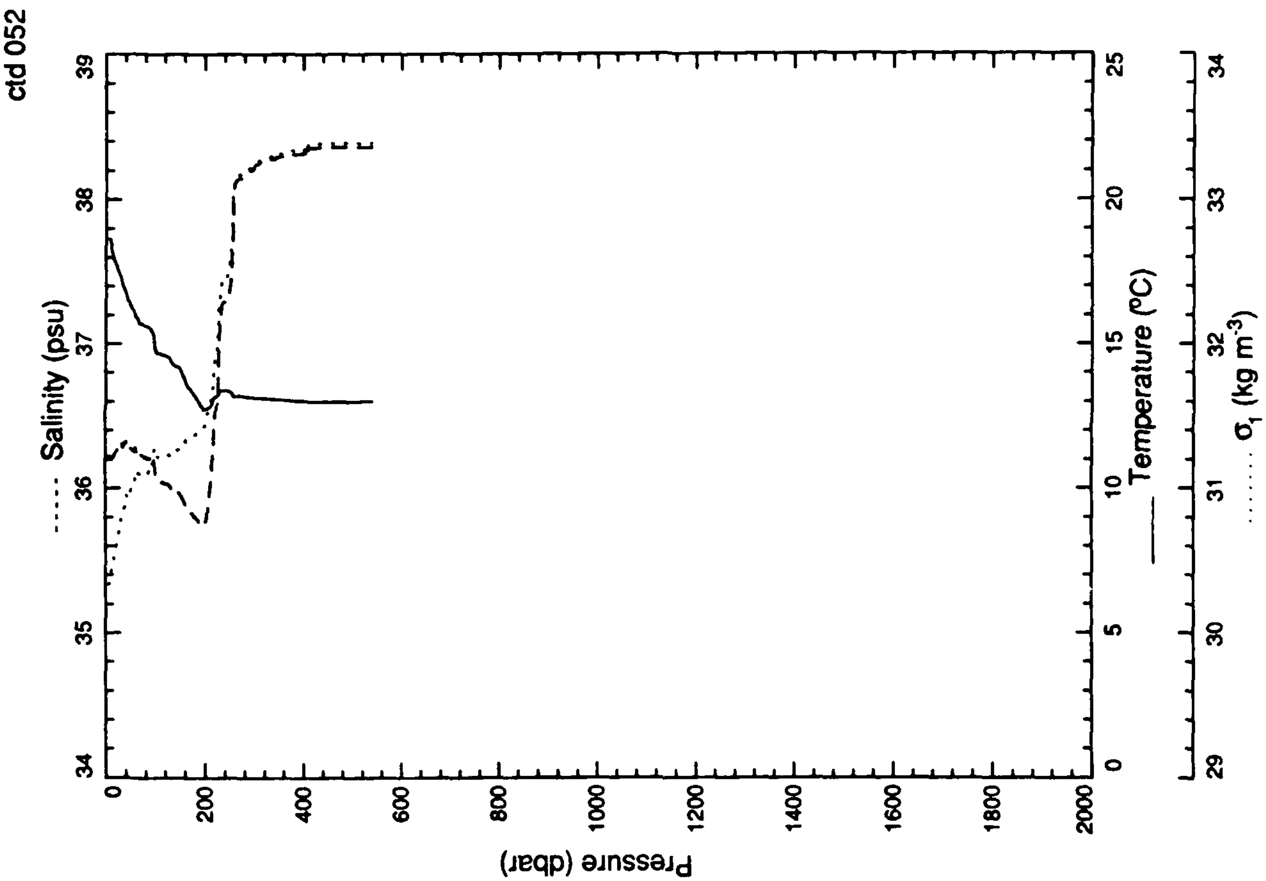

ctd 045
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

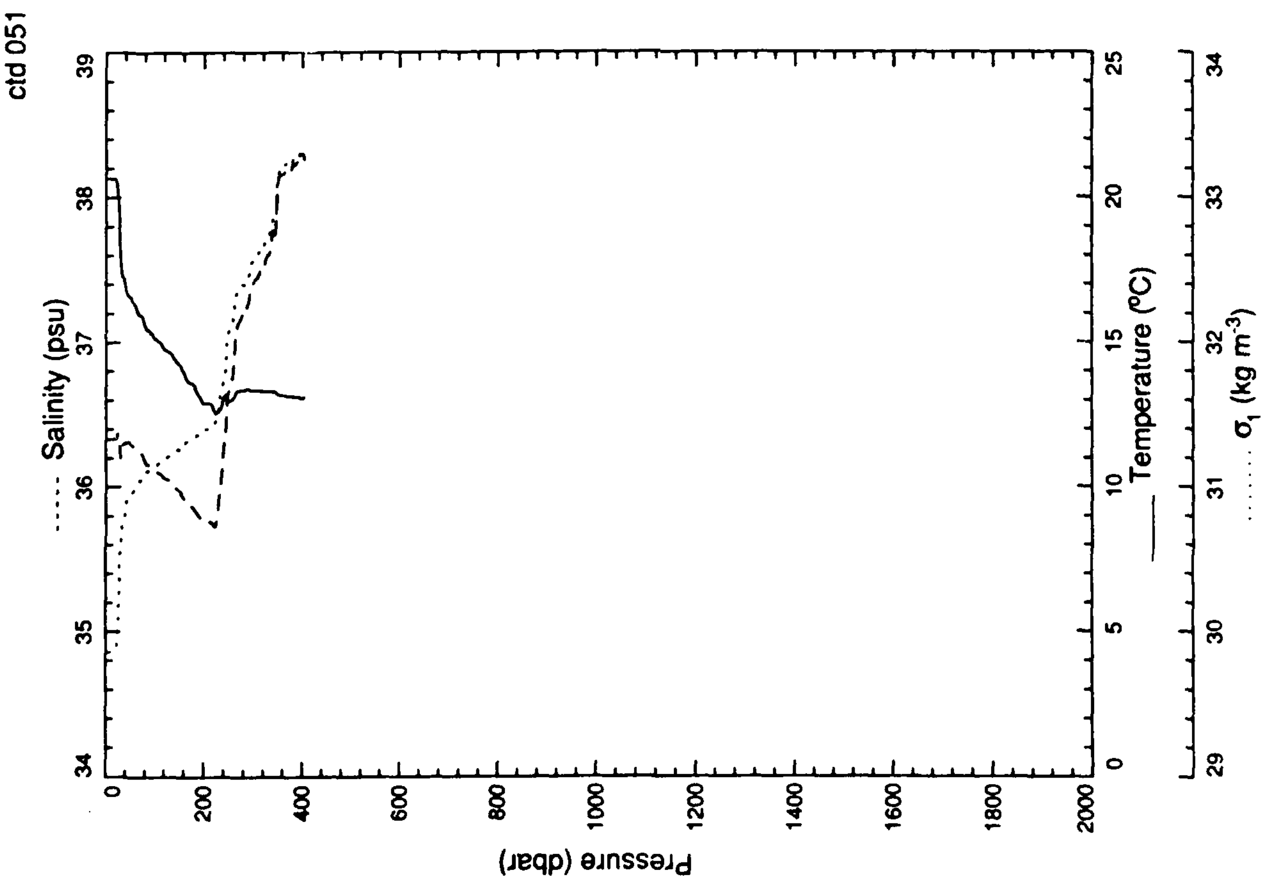

ctd 048
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

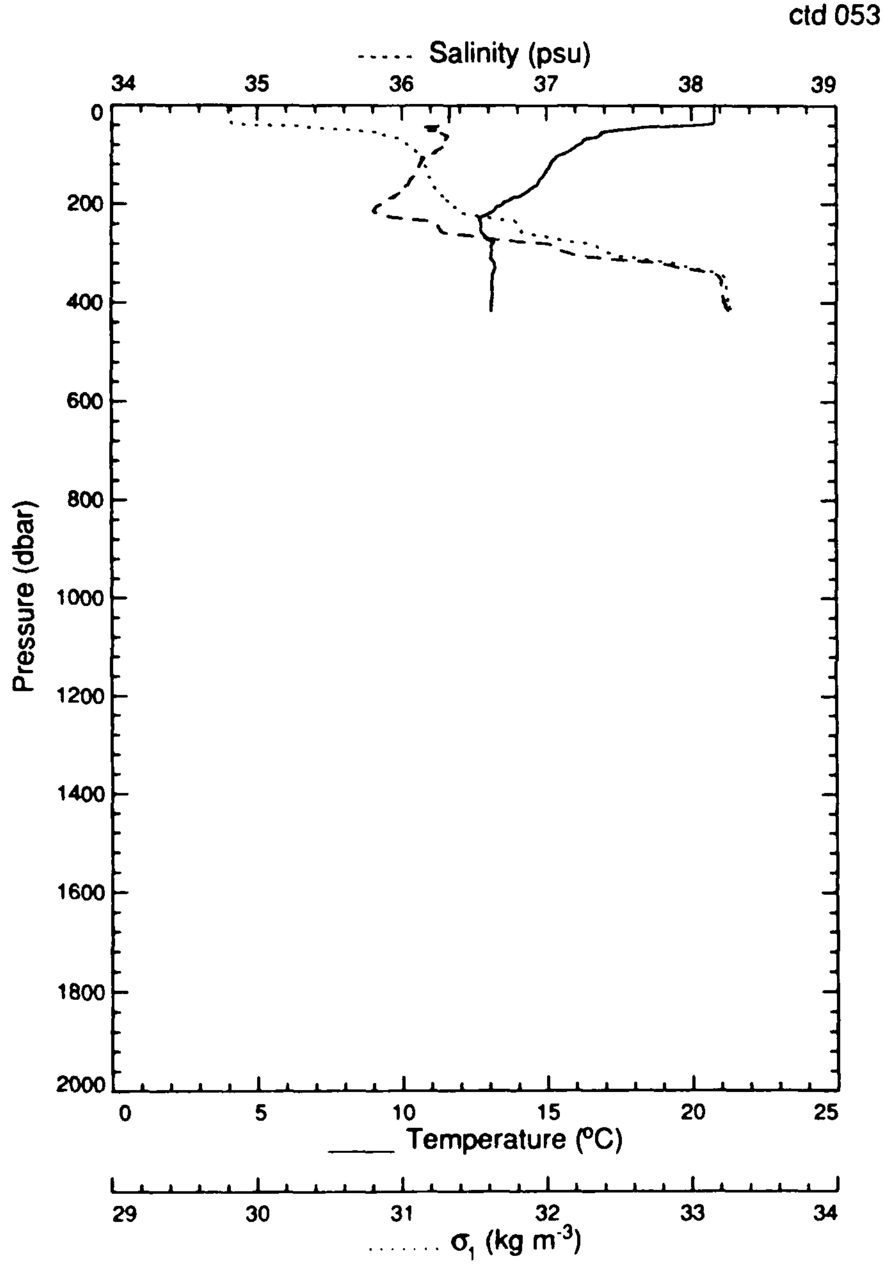

ctd 047
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

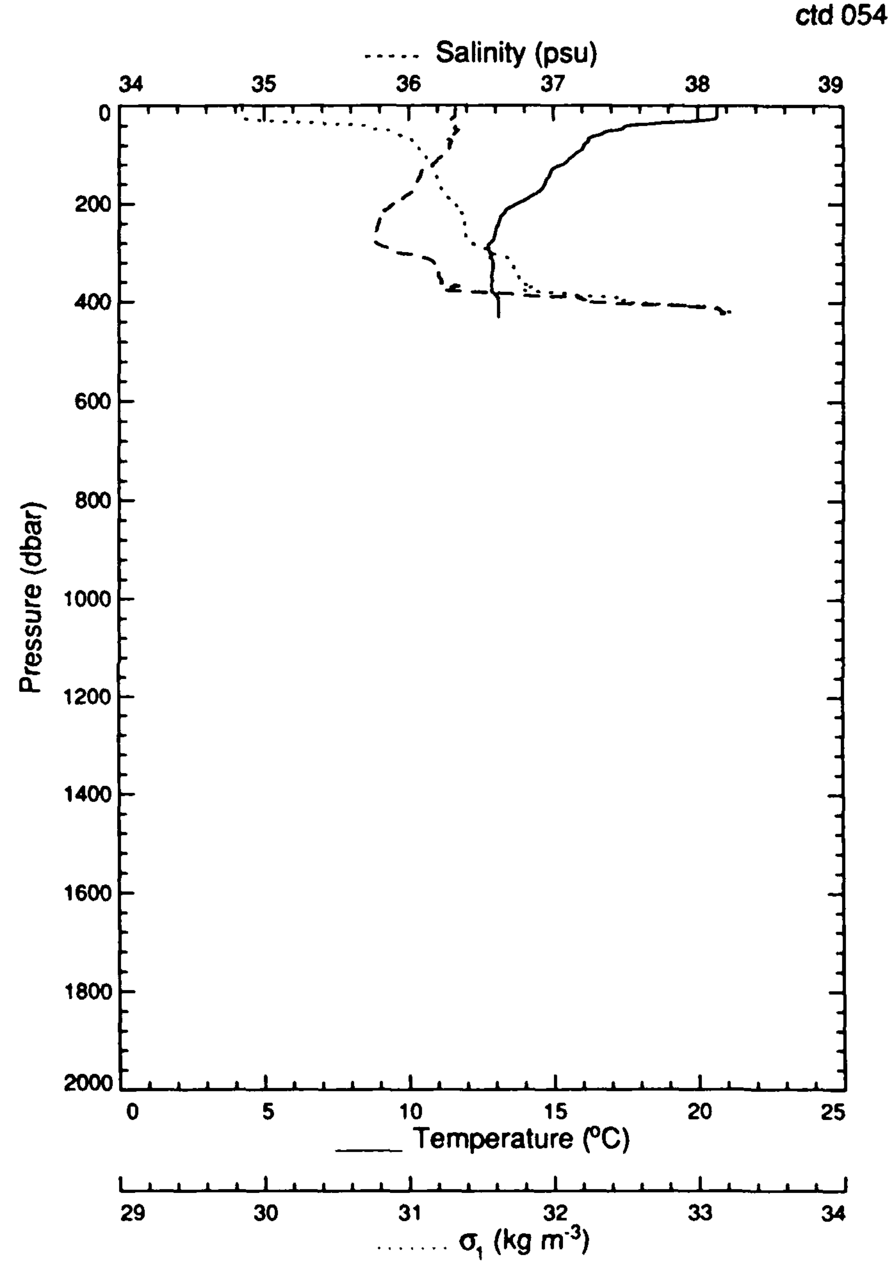

ctd 049
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

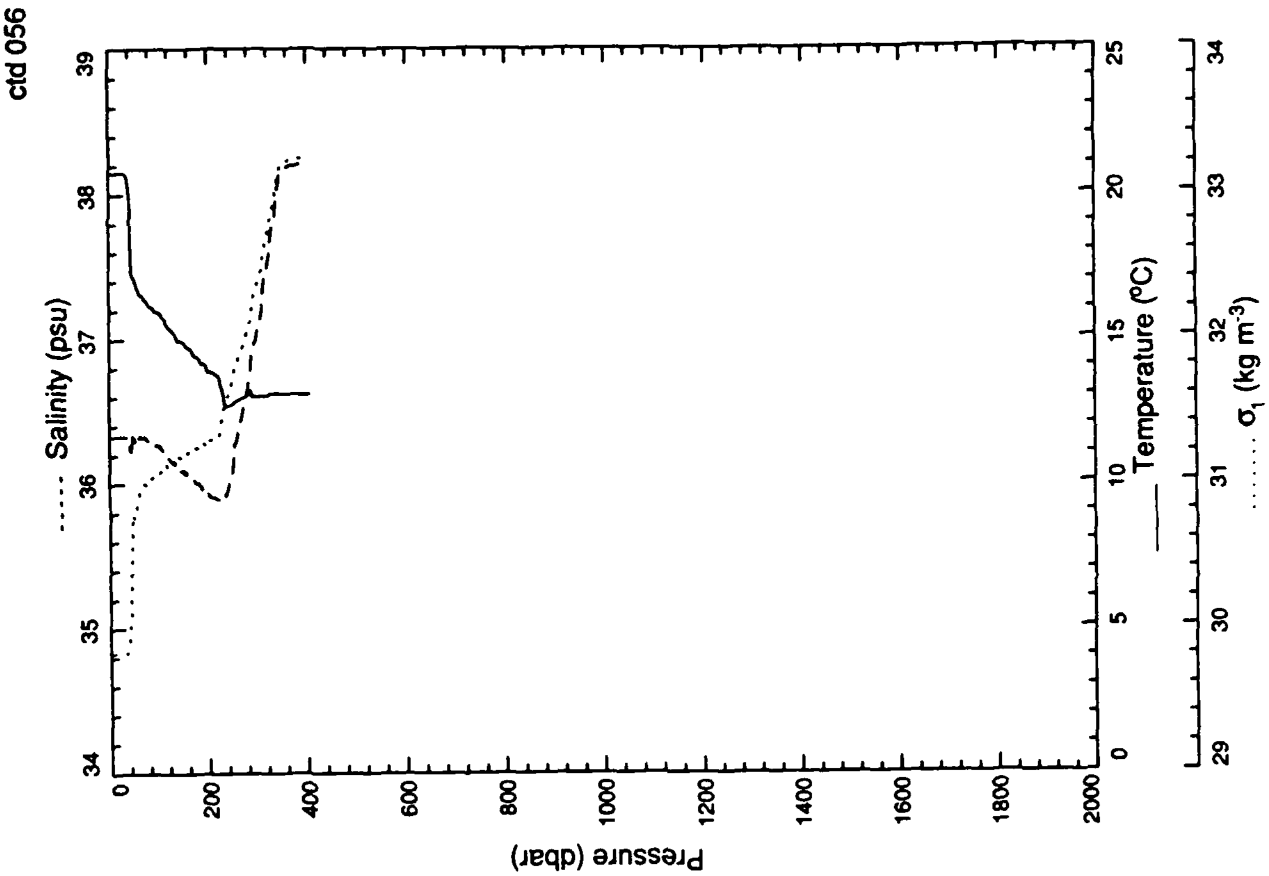

ctd 050
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

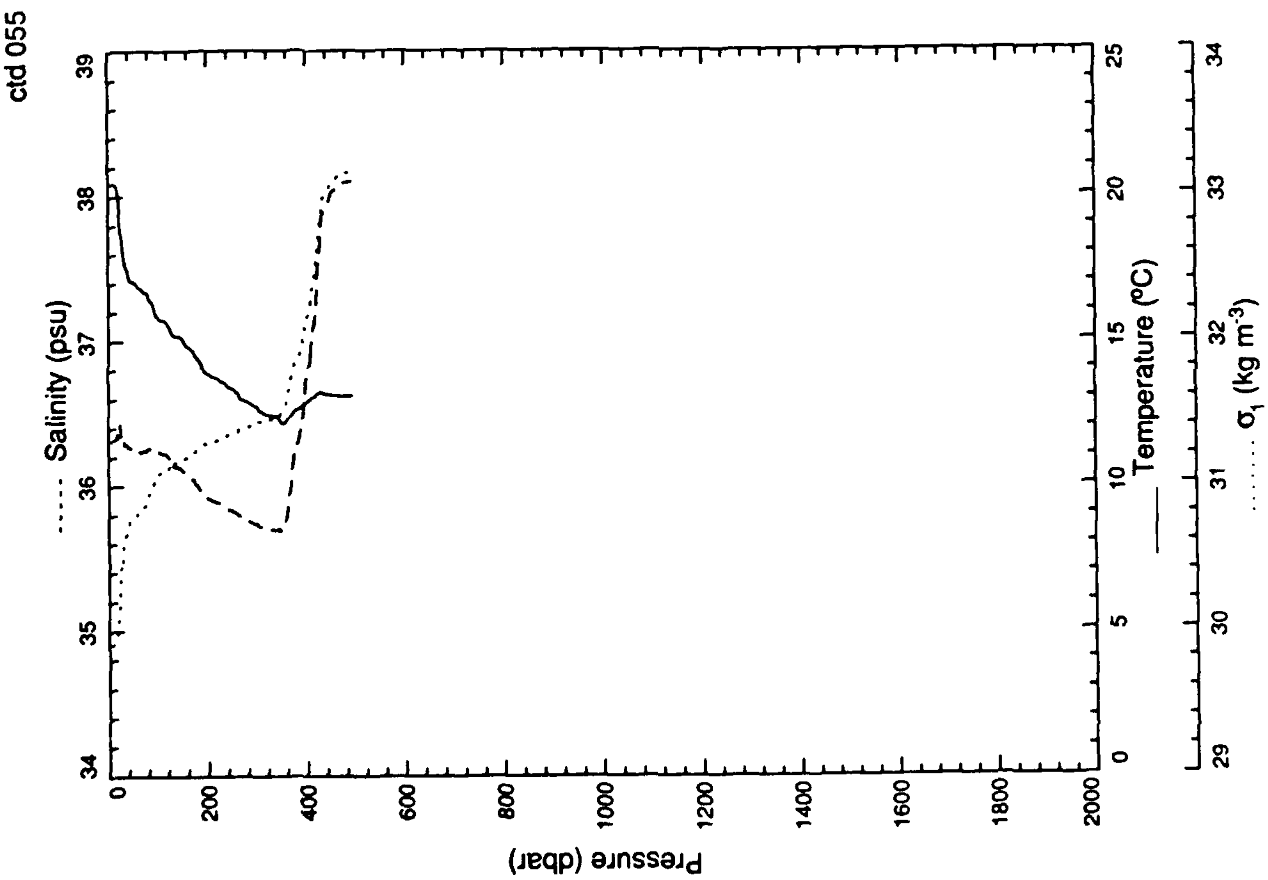

ctd 052
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

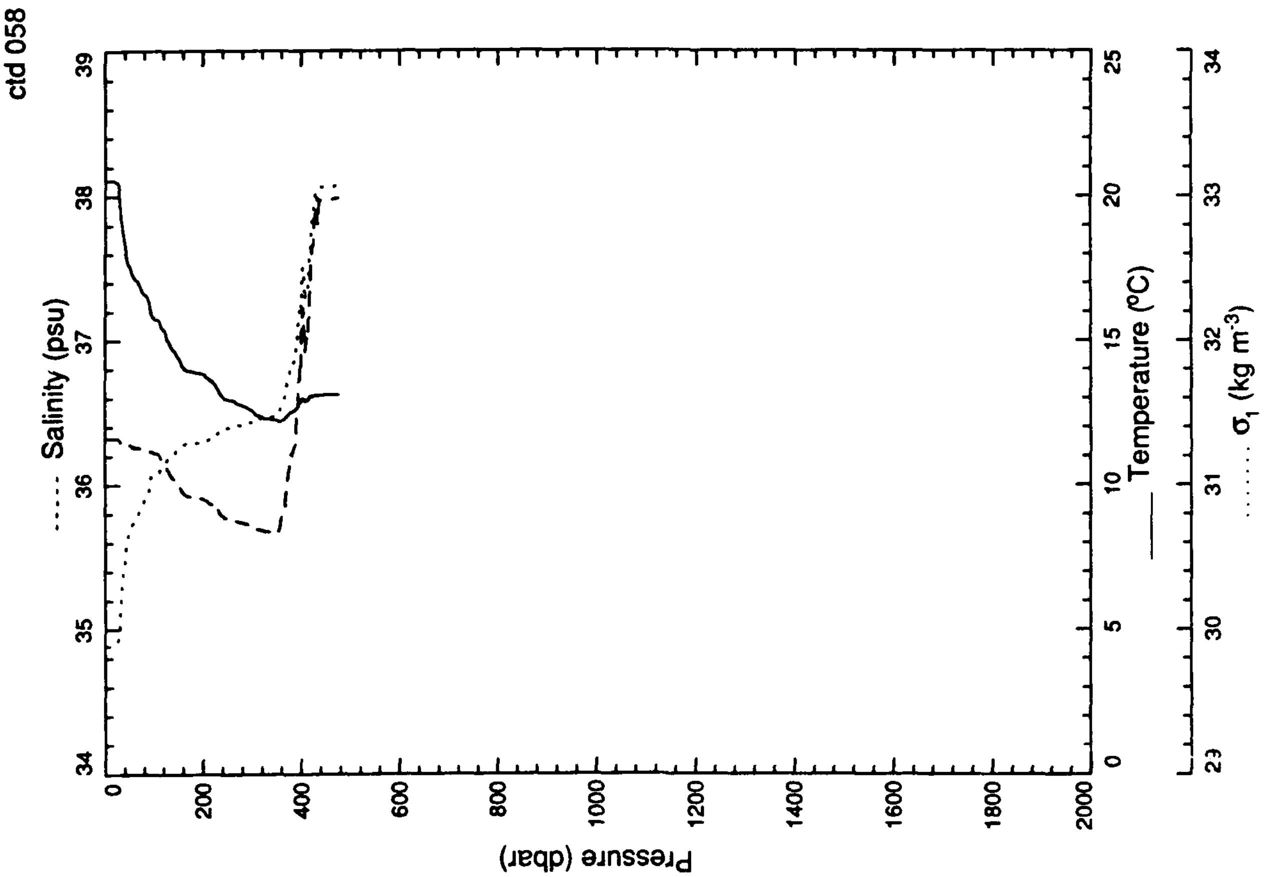

ctd 051
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

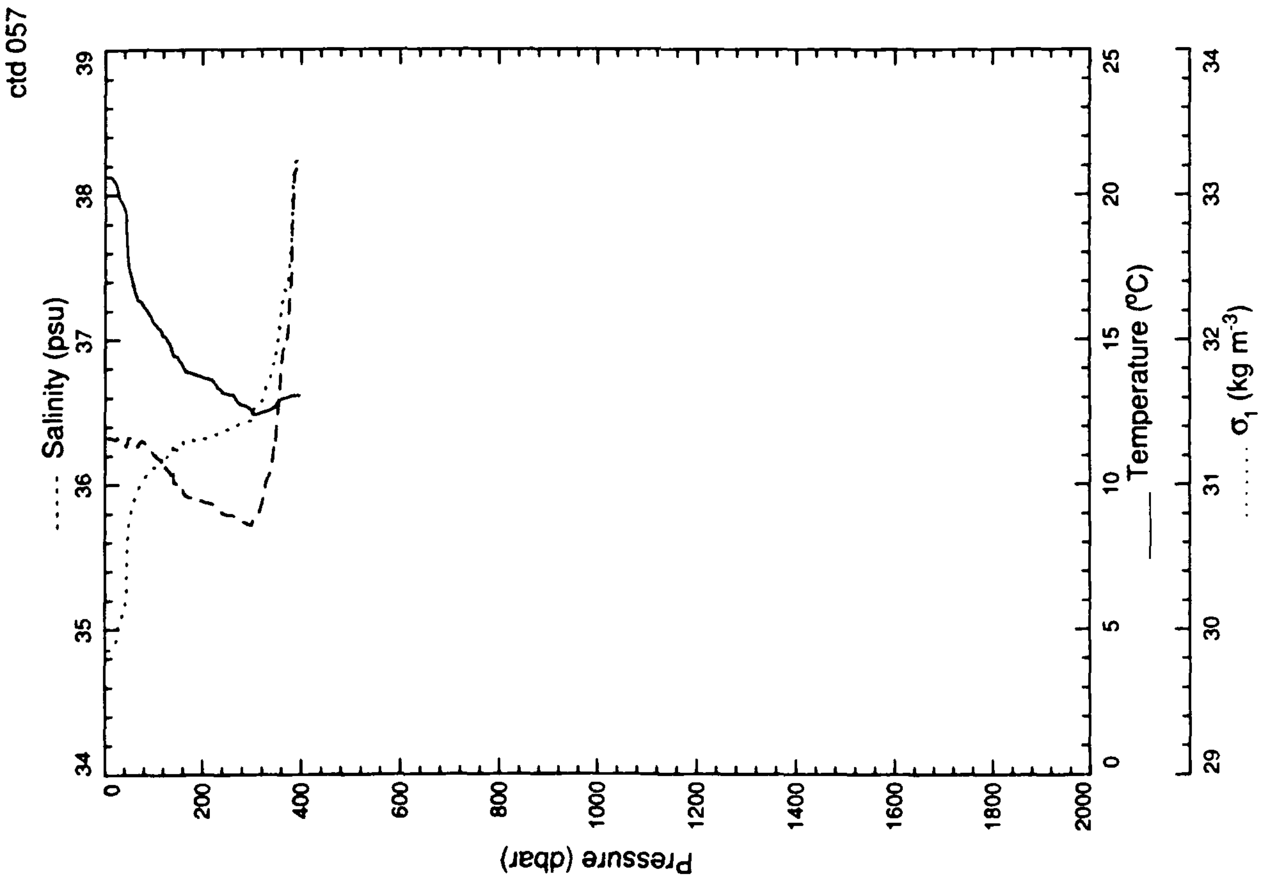

ctd 053
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ_1 (kg m^{-3})

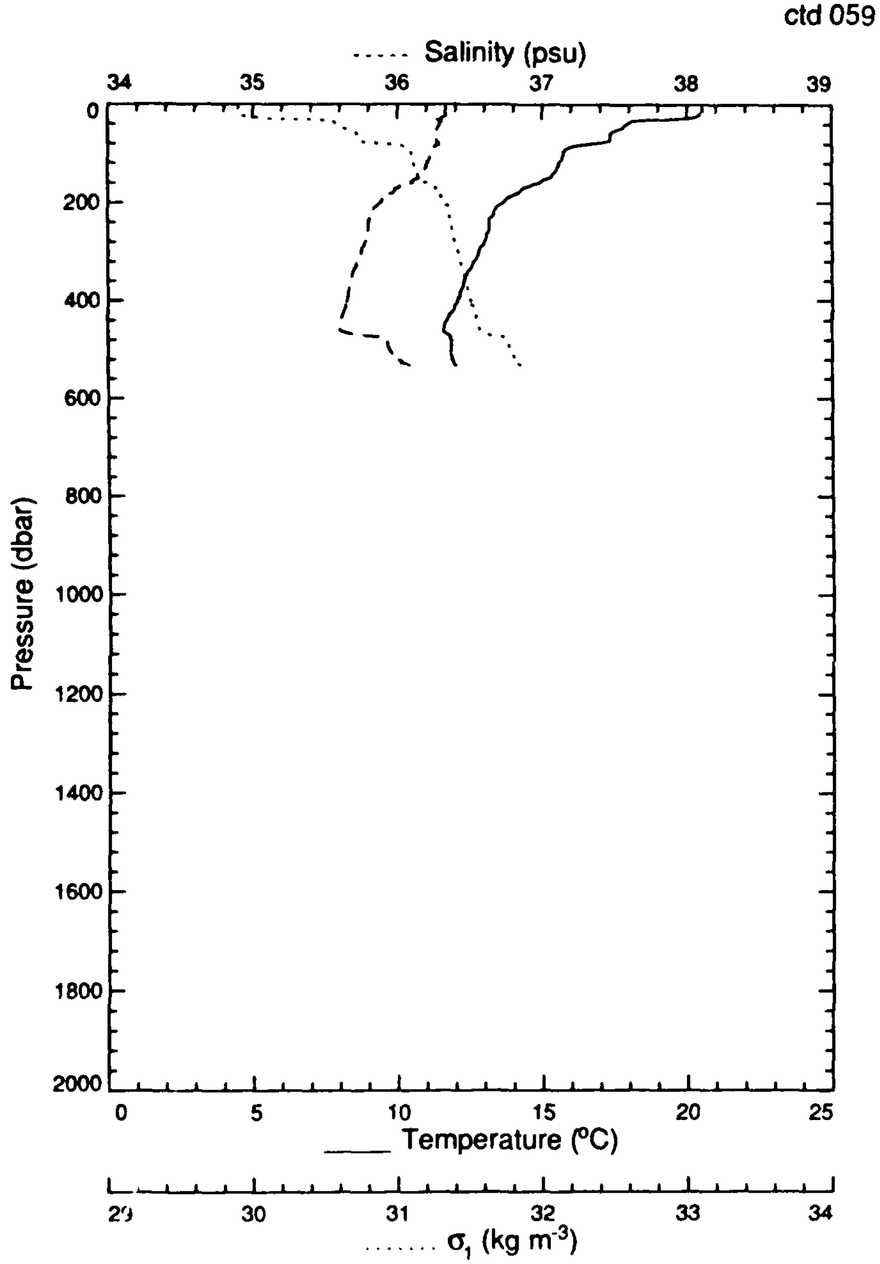

ctd 054
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ_1 (kg m^{-3})

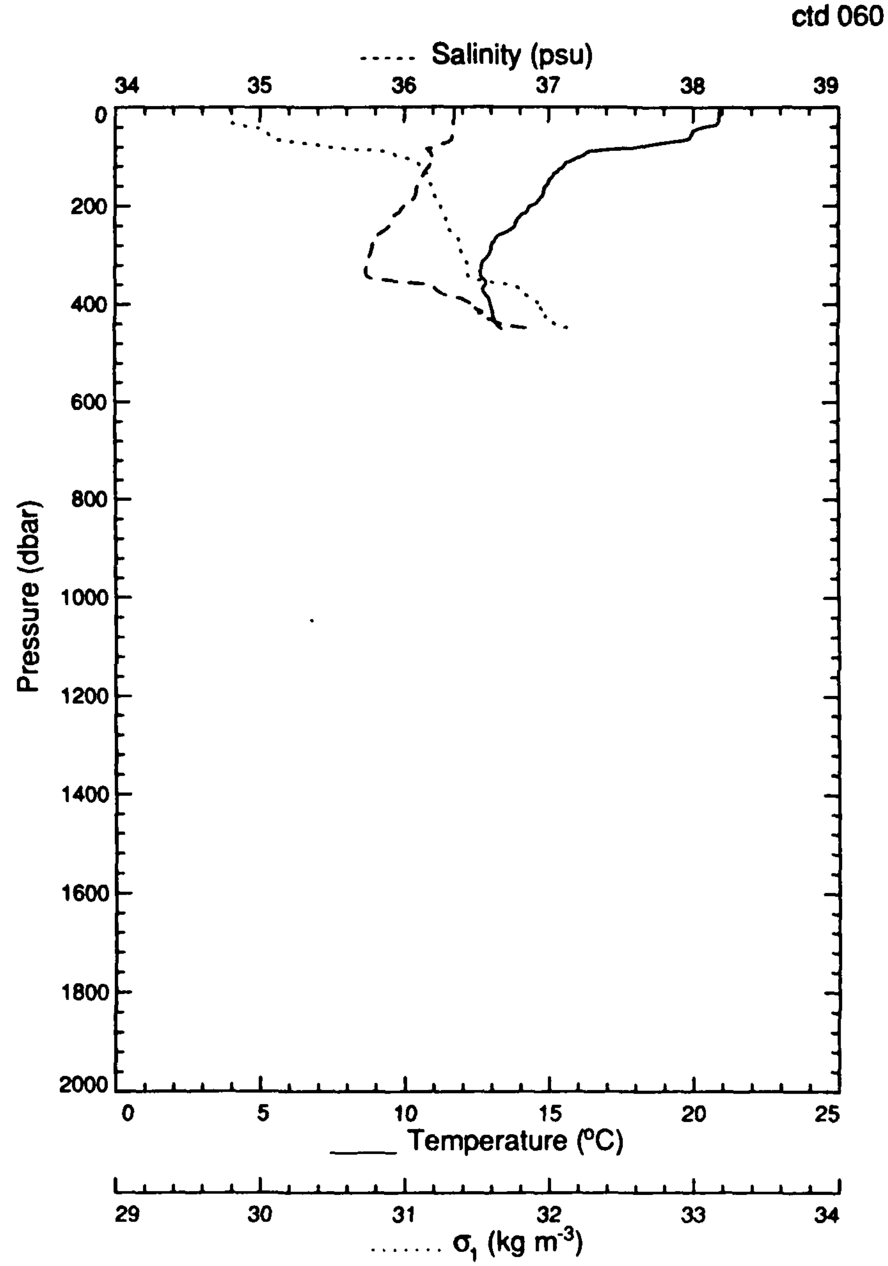

ctd 056
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

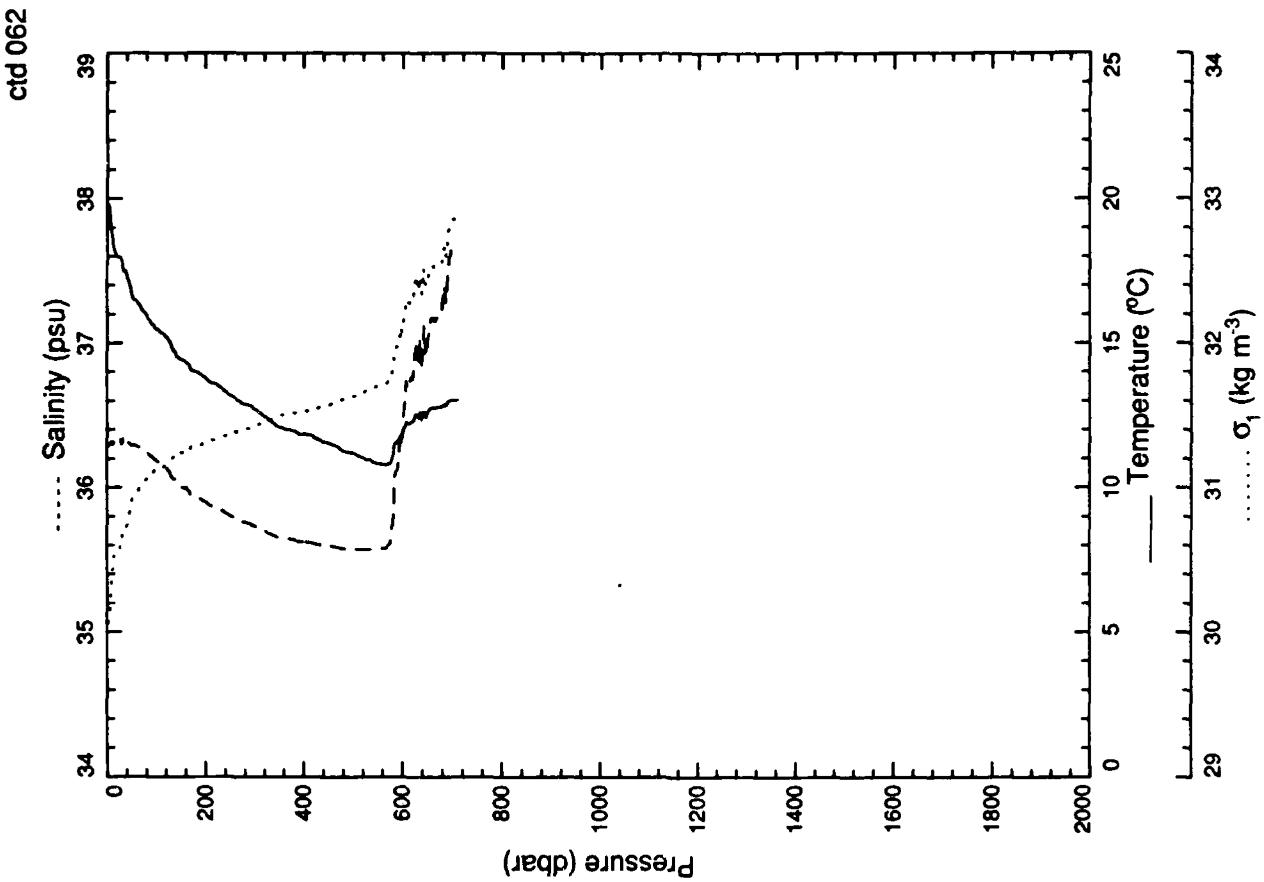

ctd 055
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

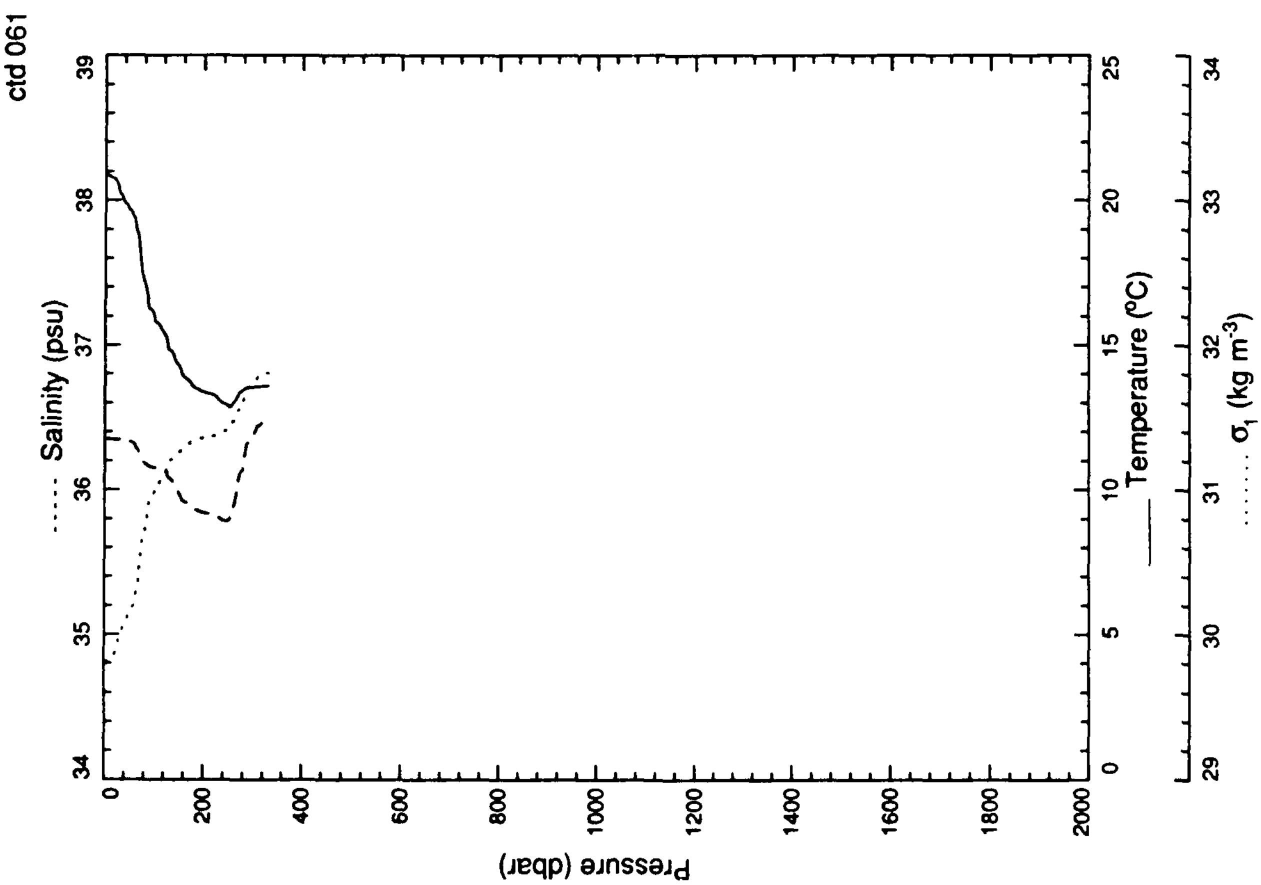

ctd 058
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

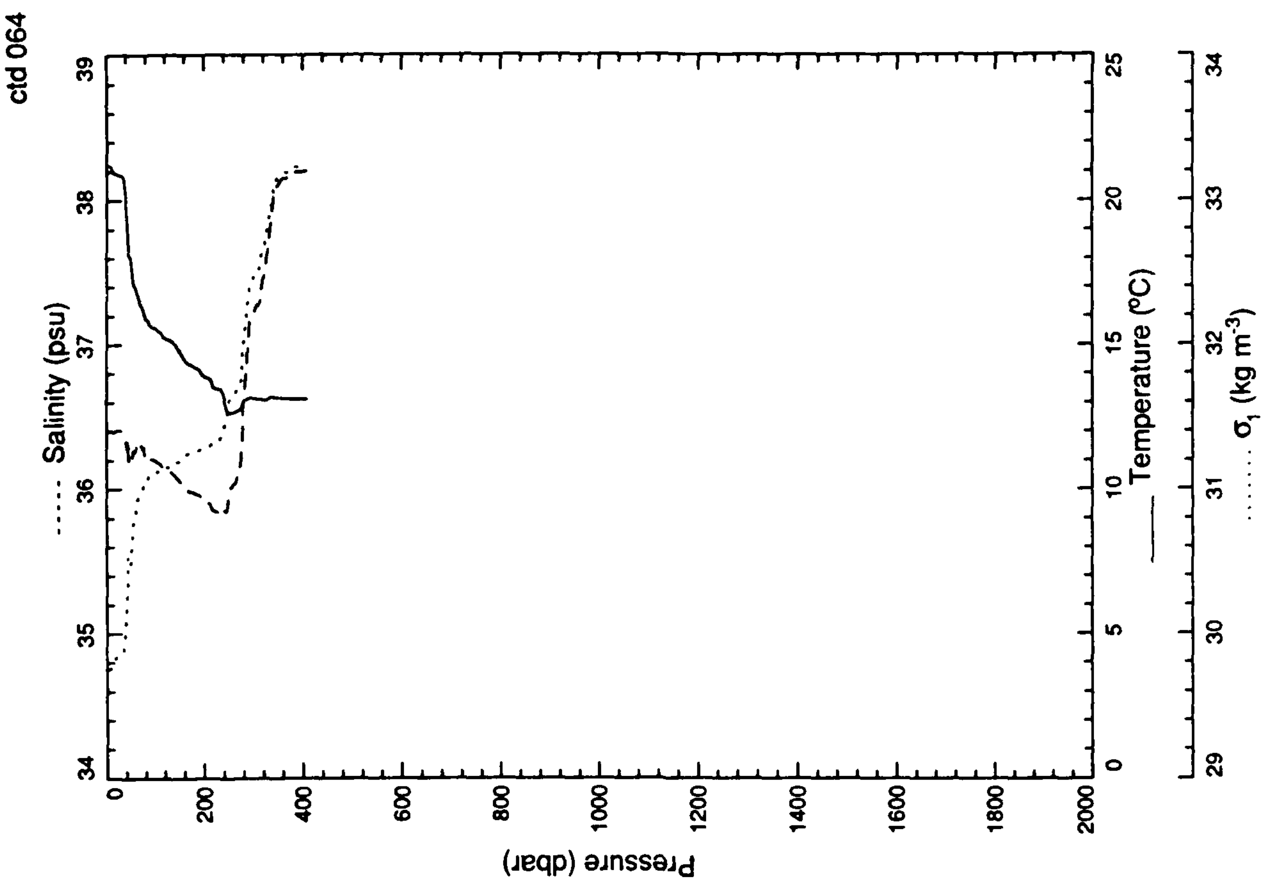

ctd 057
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

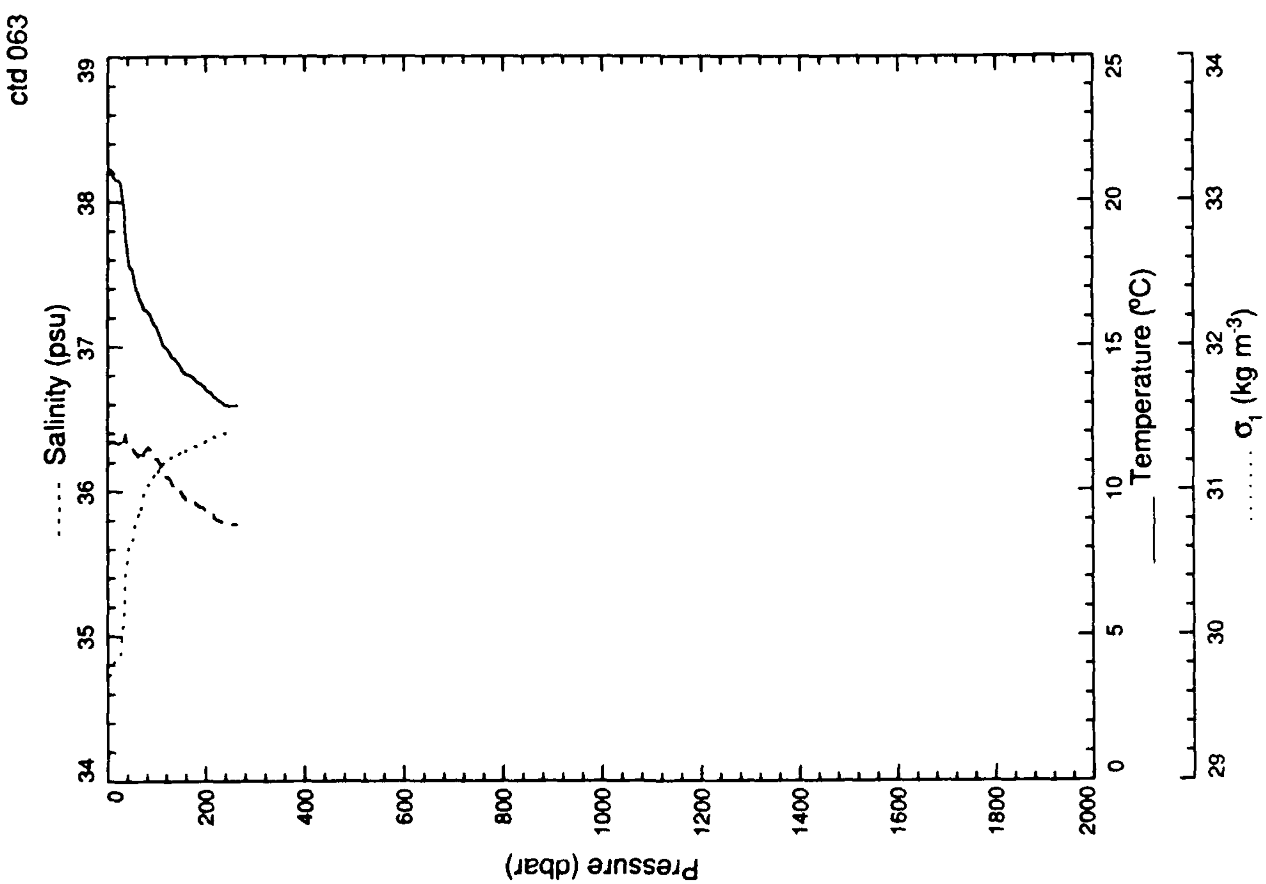

ctd 059
Salinity (psu)
34
35
36
37
38
39
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Pressure (dbar)
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

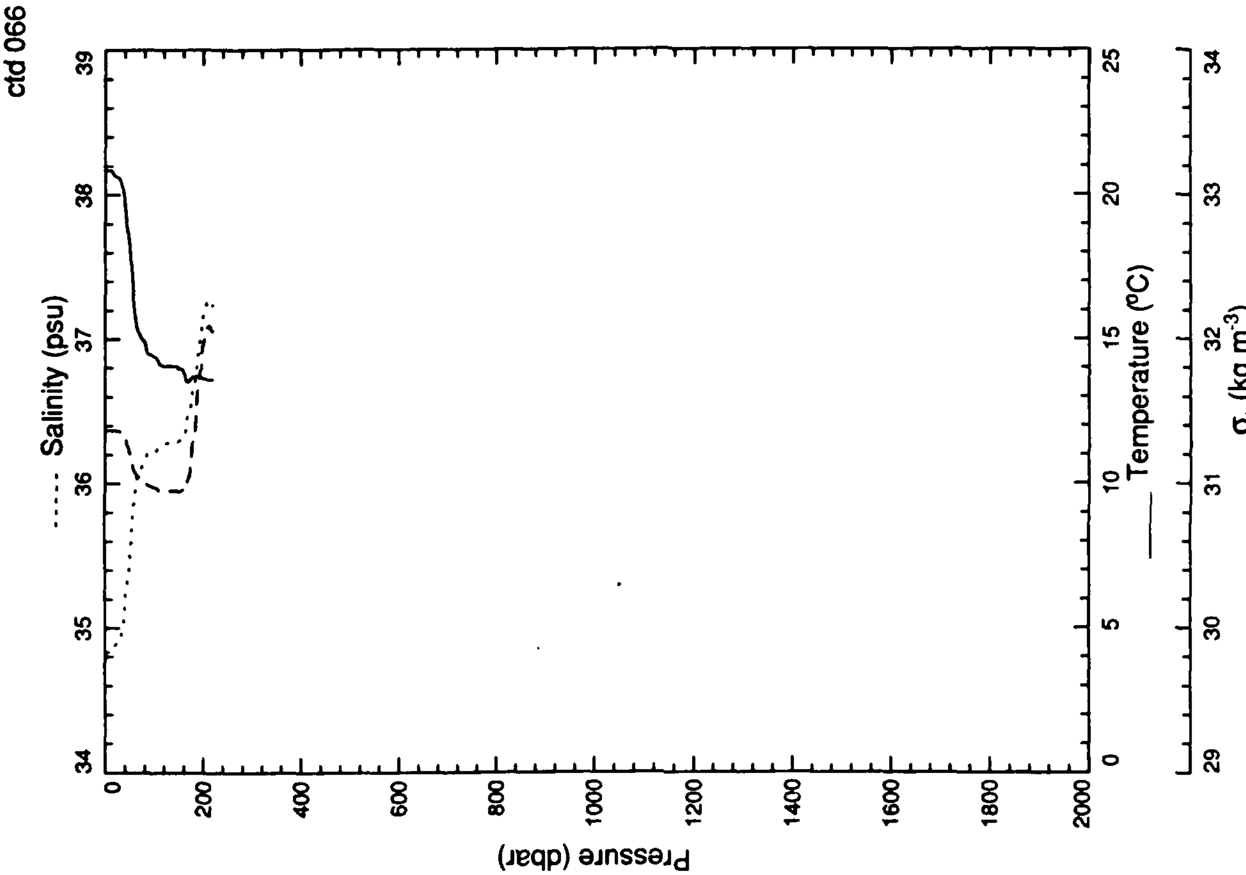

ctd 060
Salinity (psu)
34
35
36
37
38
39
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Pressure (dbar)
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

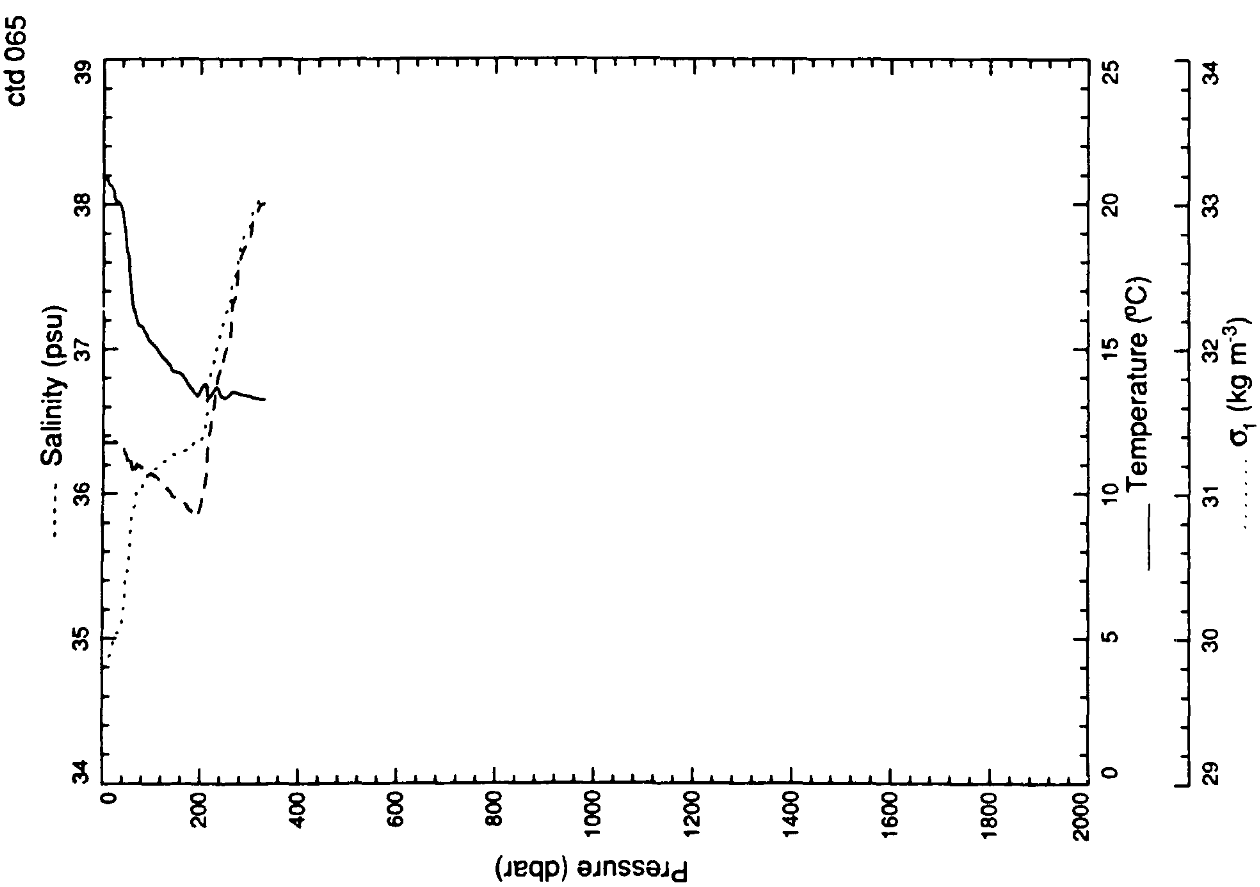

ctd 062
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

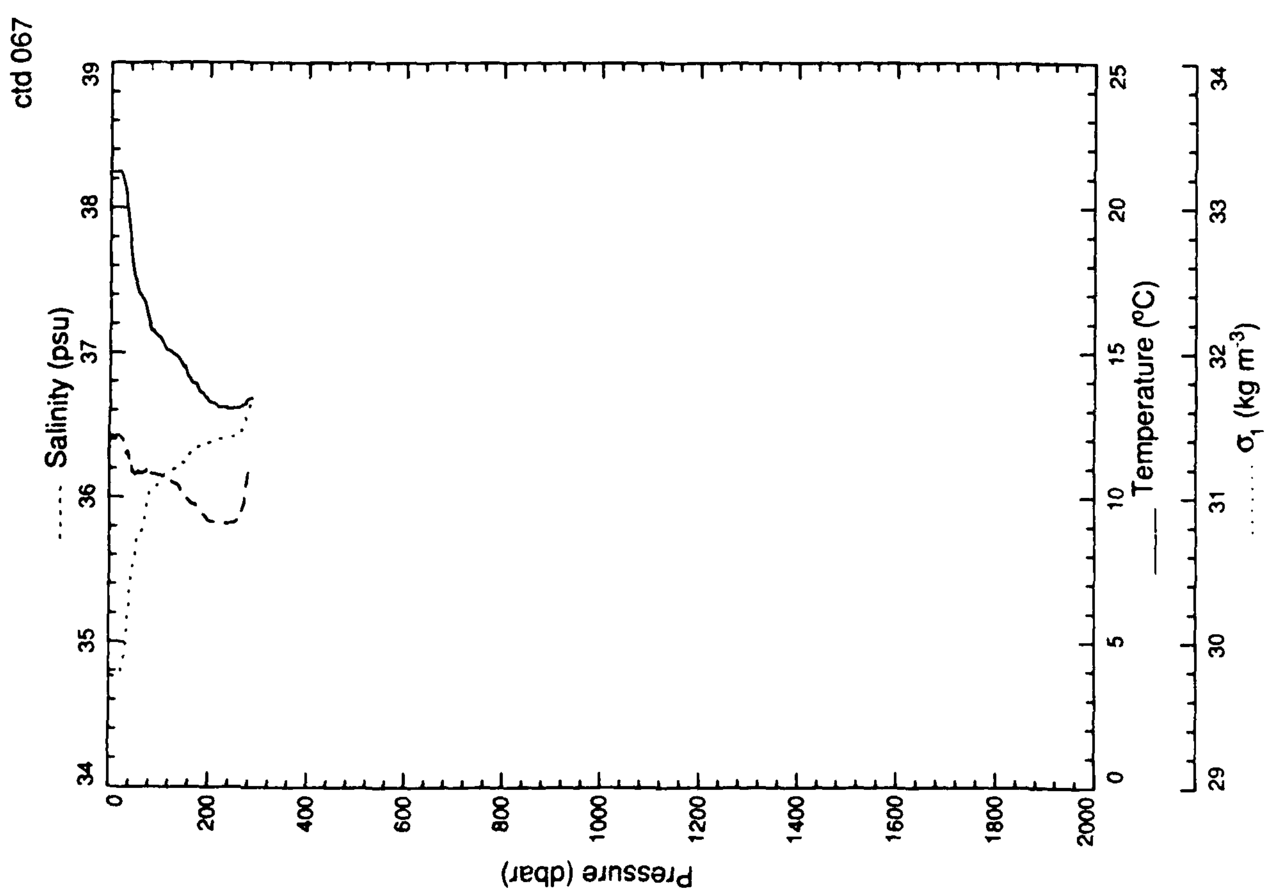

ctd 061
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

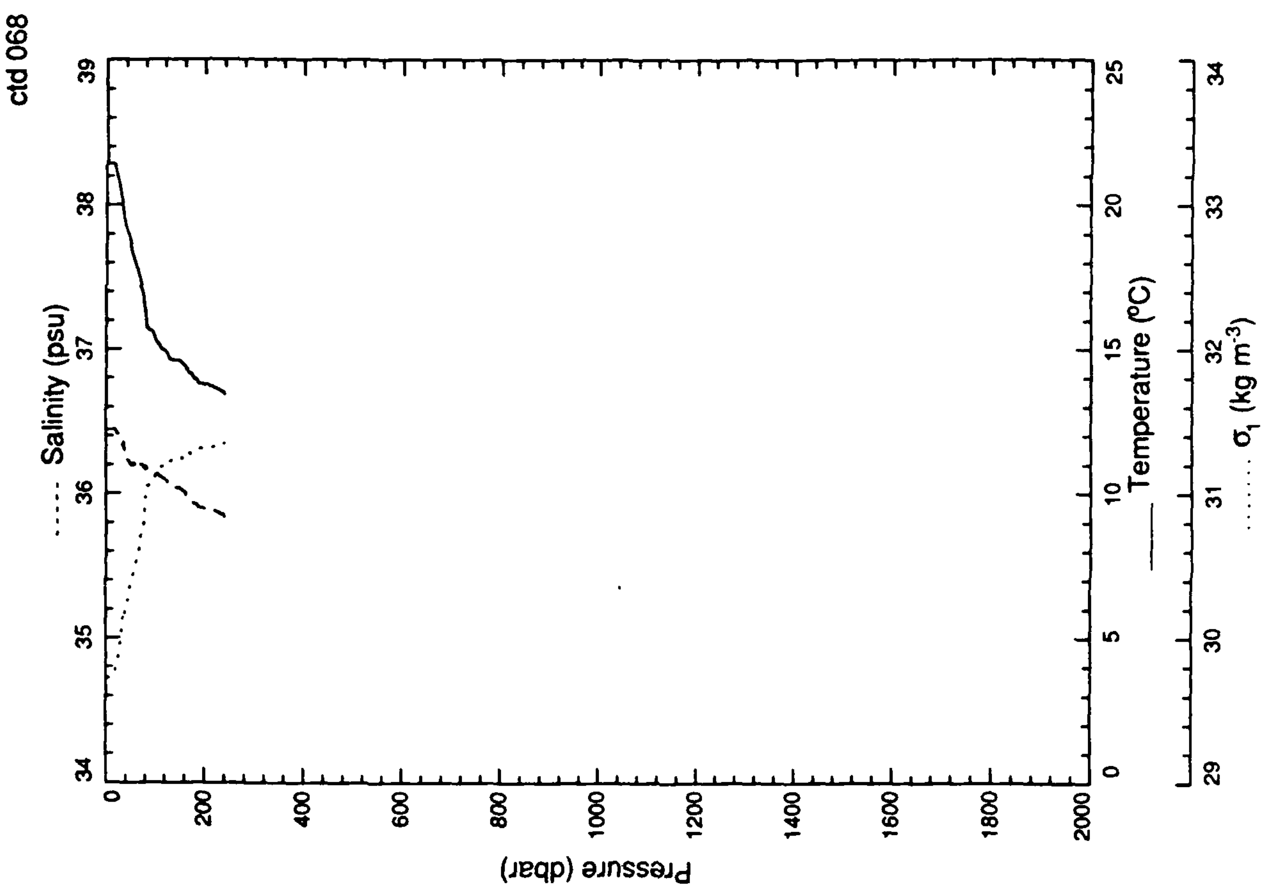

ctd 064
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

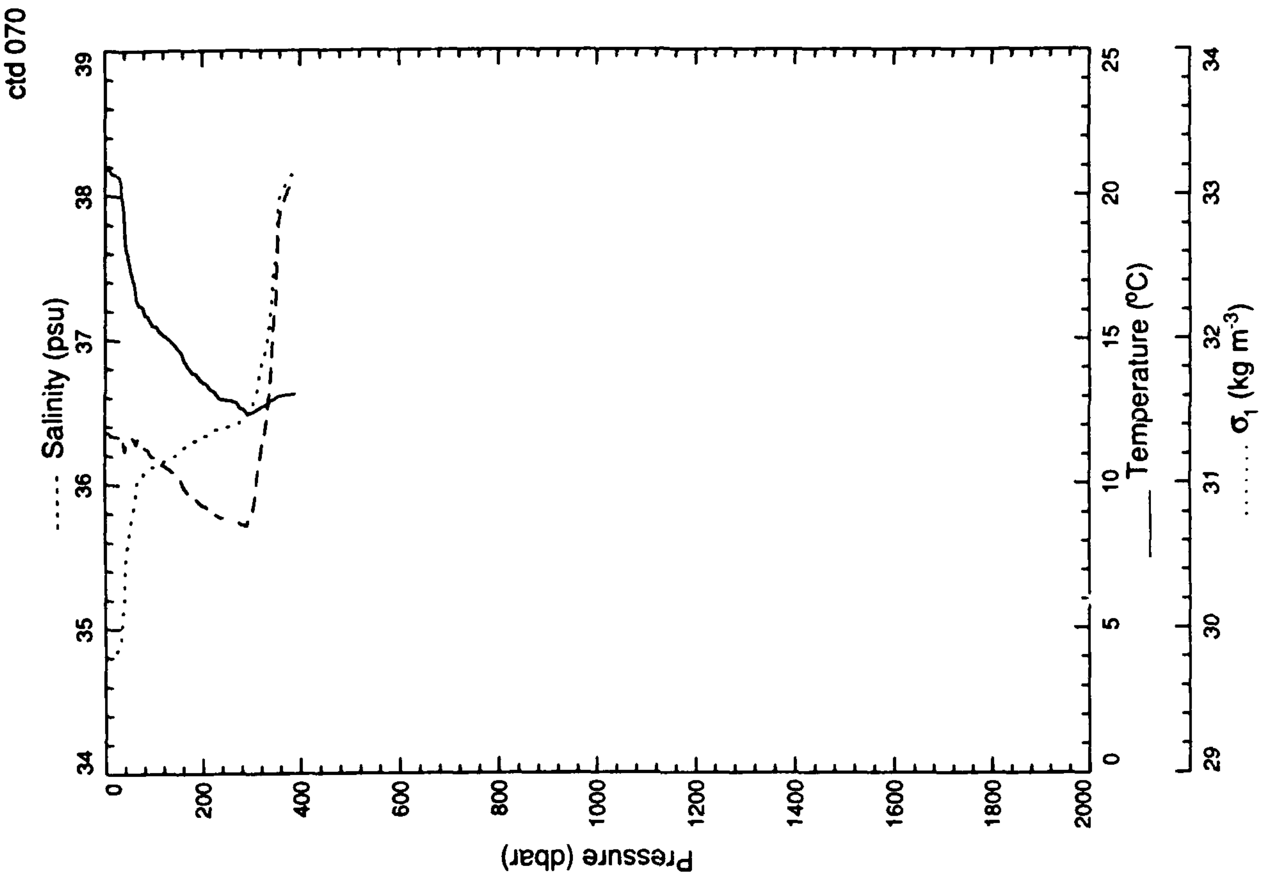

ctd 063
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

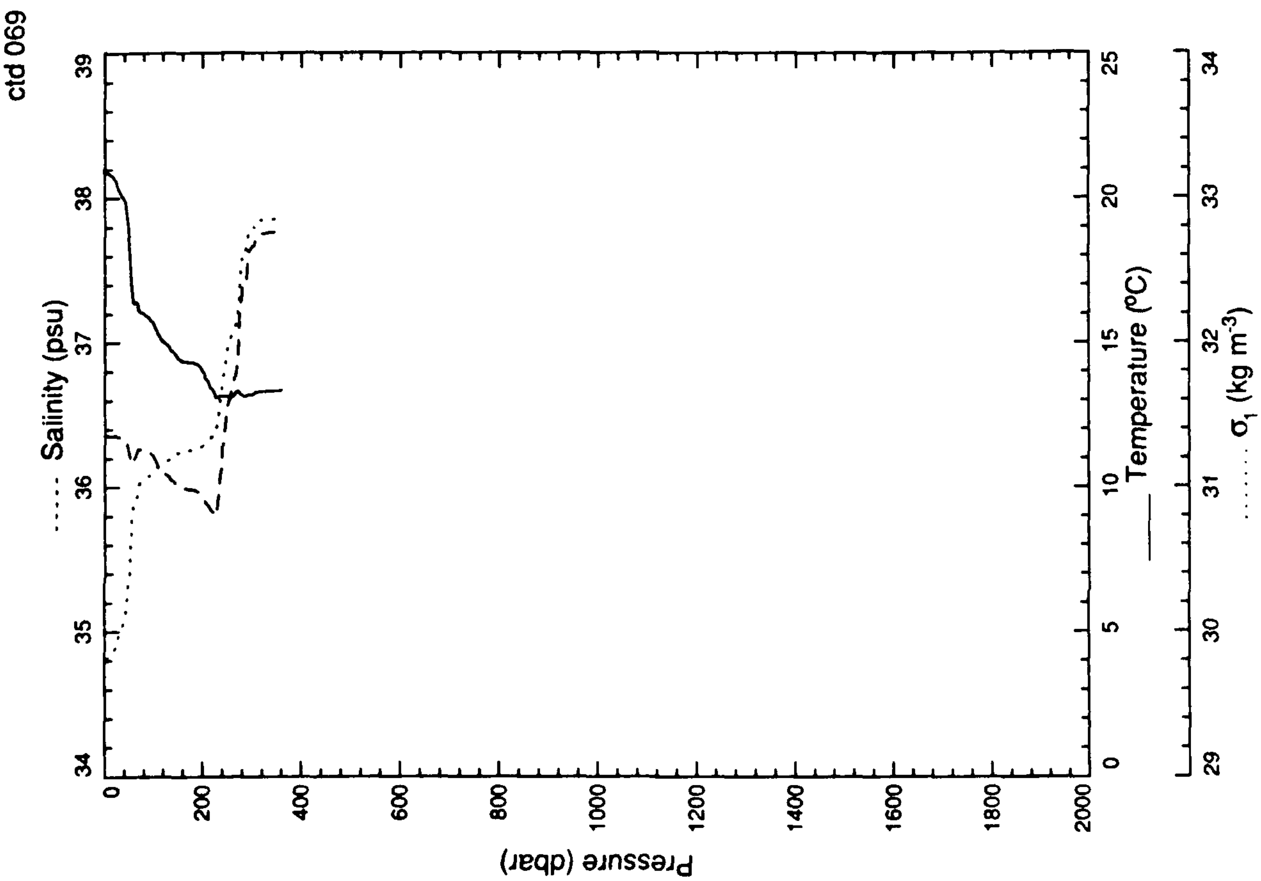

ctd 066
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)
34 35 36 37 38 39
0 5 10 15 20 25
29 30 31 32 33 34
0 200 400 600 800 1000 1200 1400 1600 1800 2000

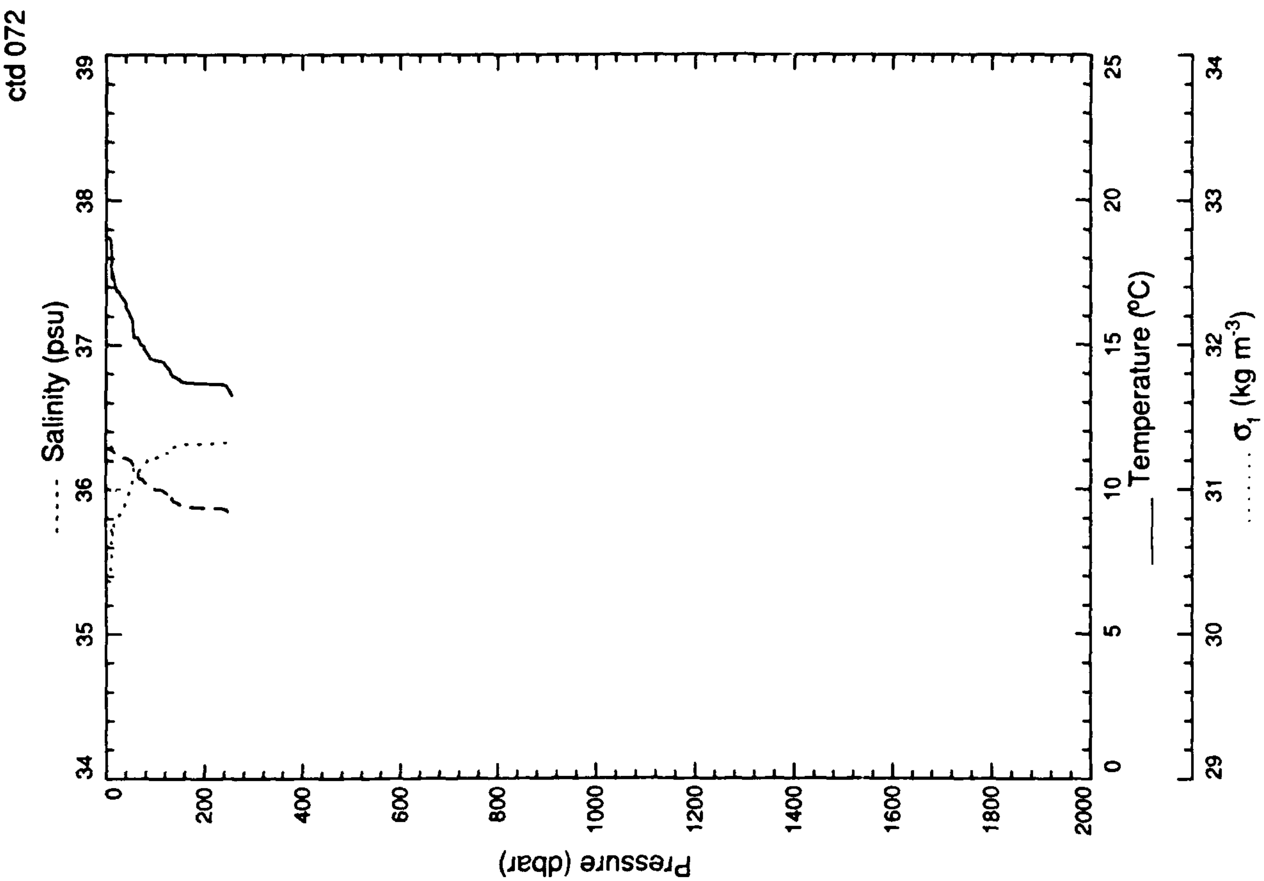

ctd 065
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)
34 35 36 37 38 39
0 5 10 15 20 25
29 30 31 32 33 34
0 200 400 600 800 1000 1200 1400 1600 1800 2000

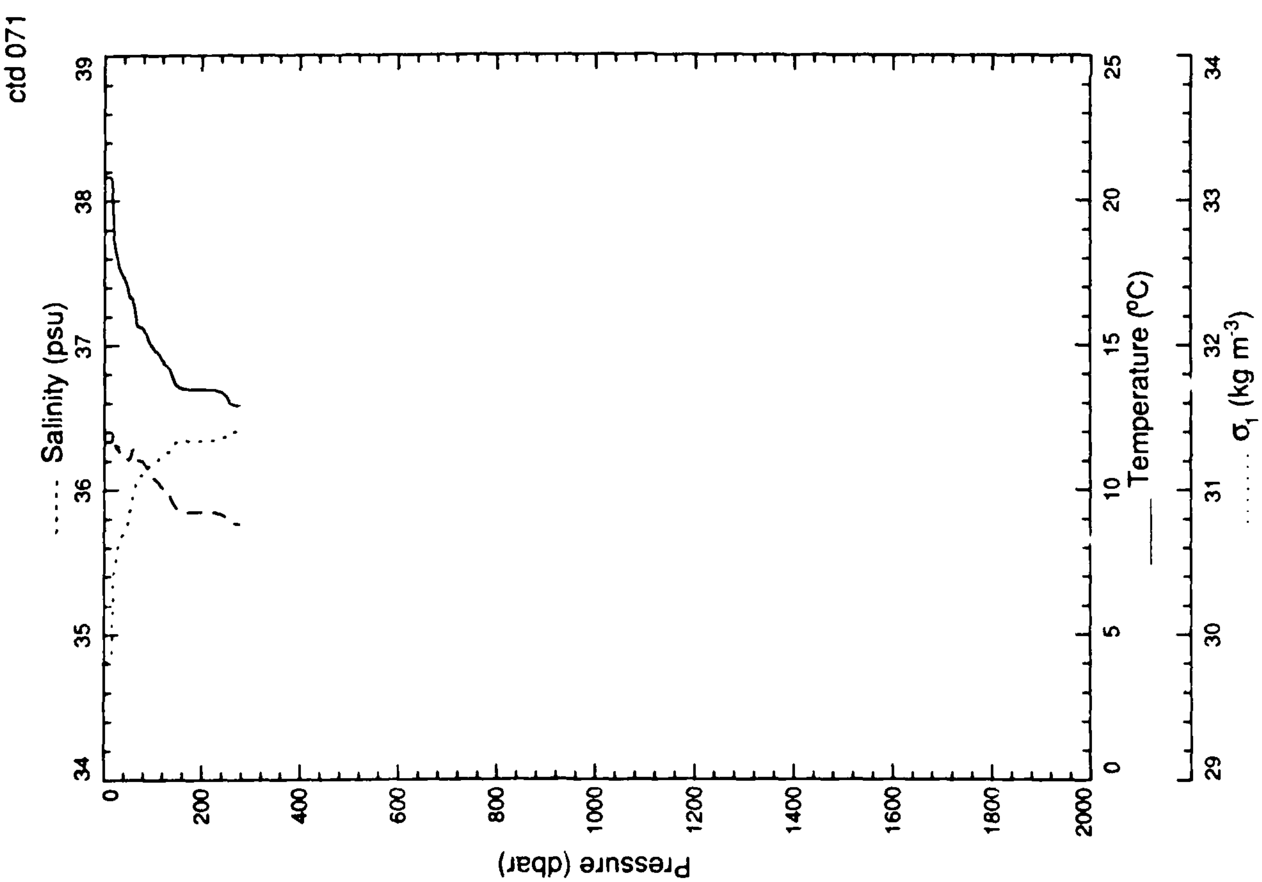

ctd 067
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

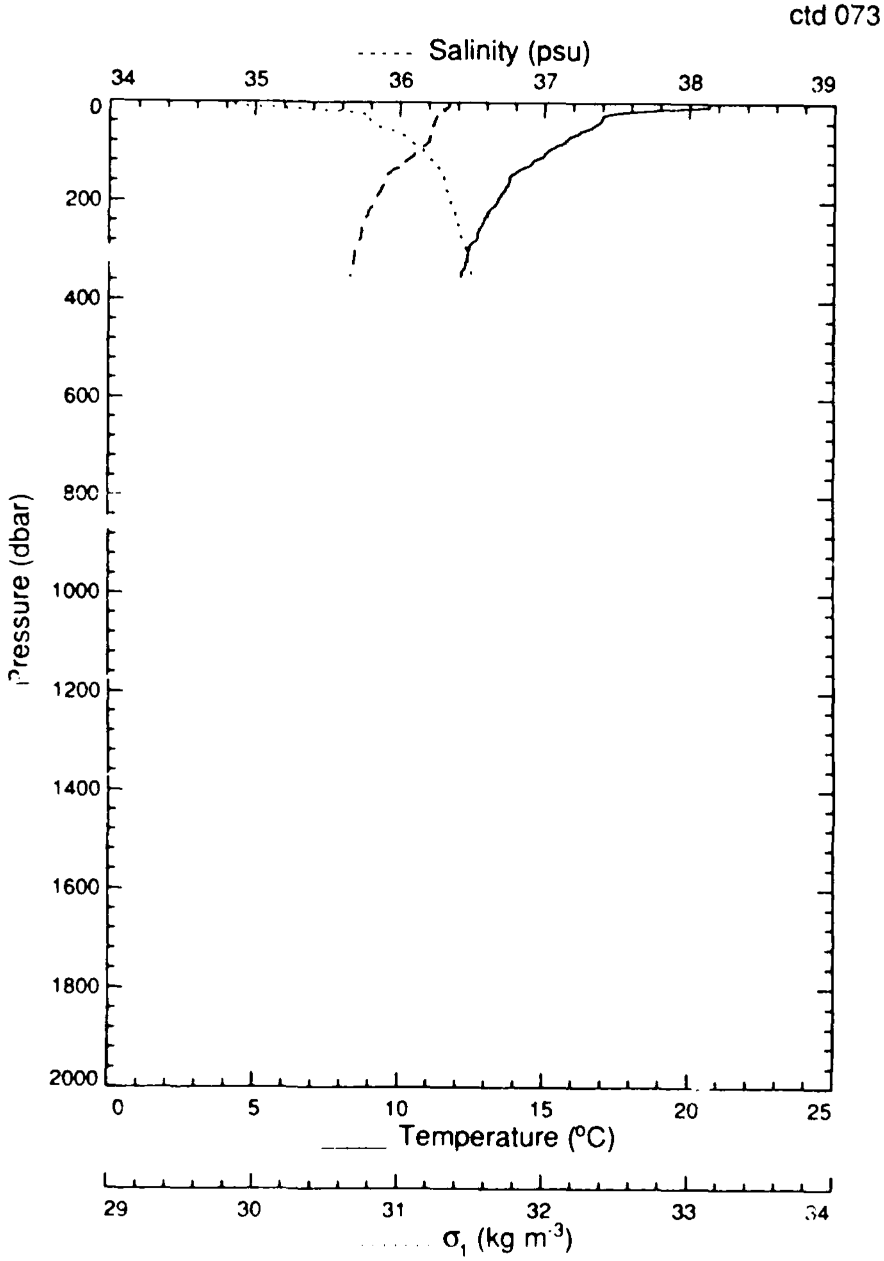

ctd 068
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

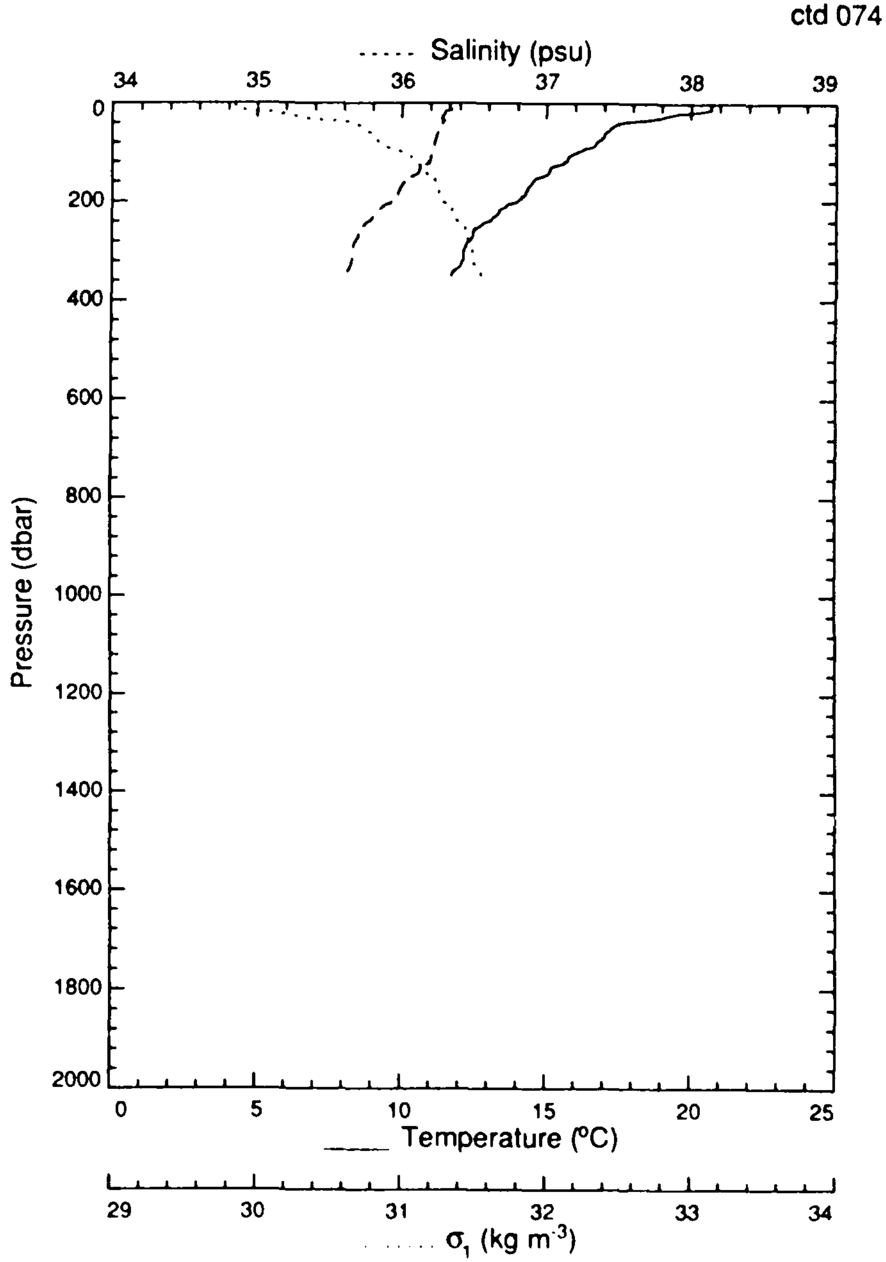

ctd 070
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

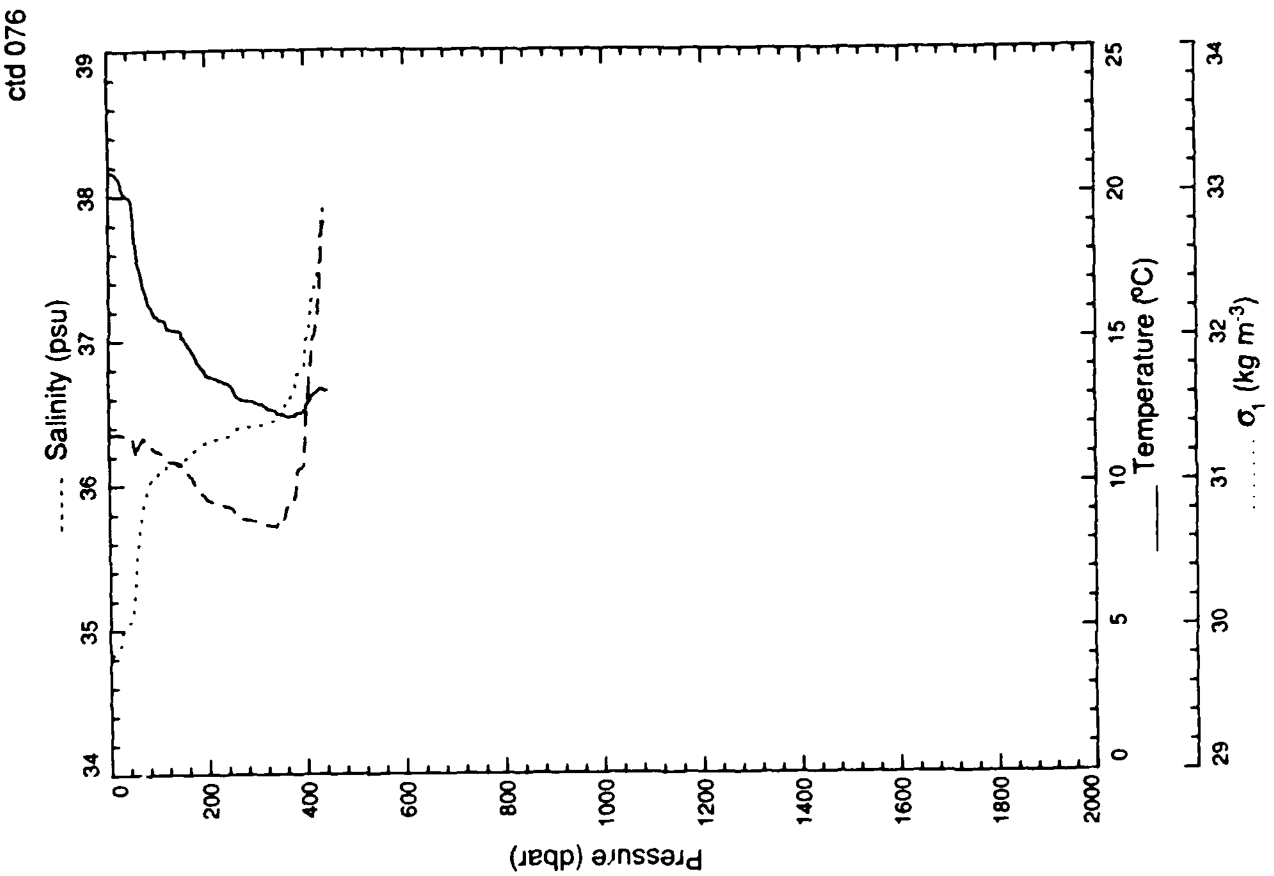

ctd 069
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

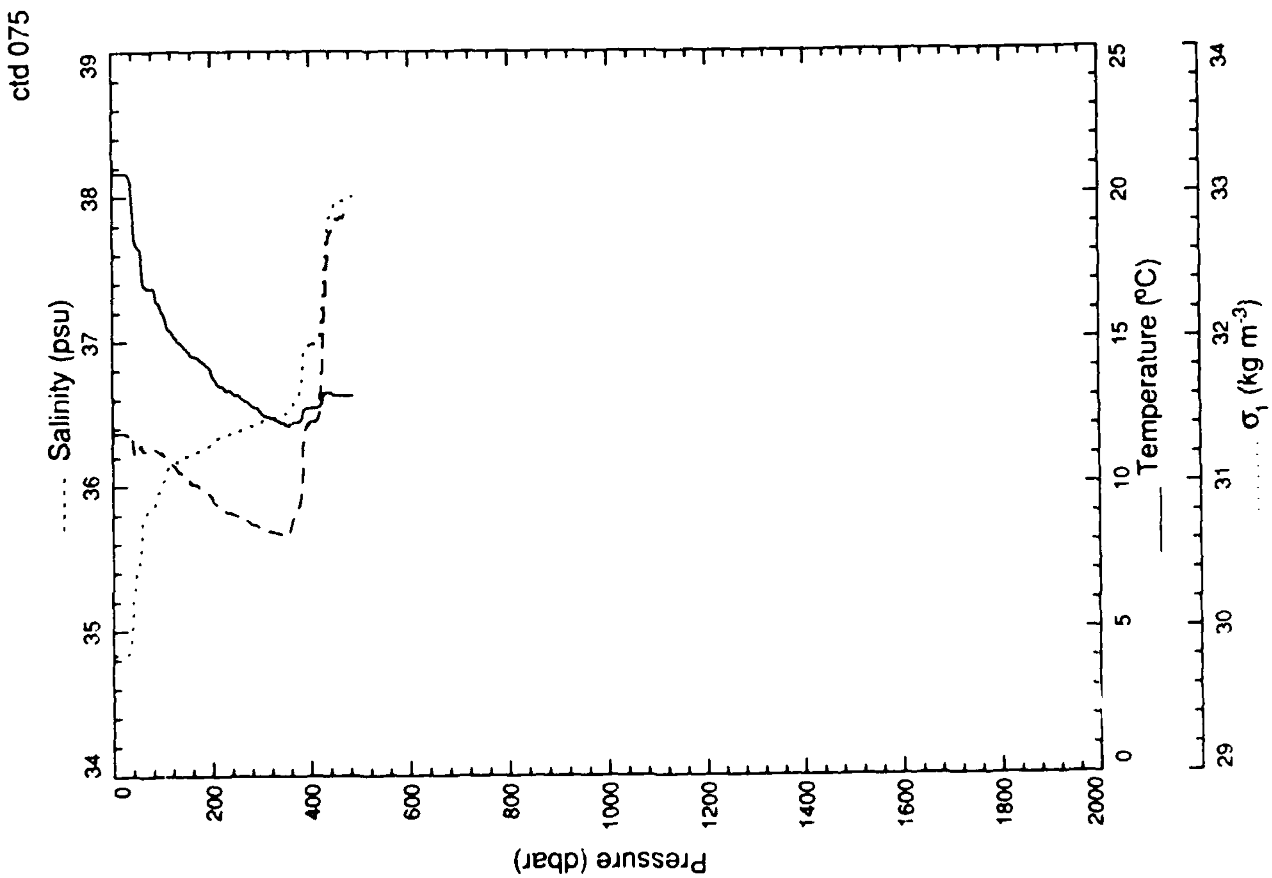

ctd 072
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

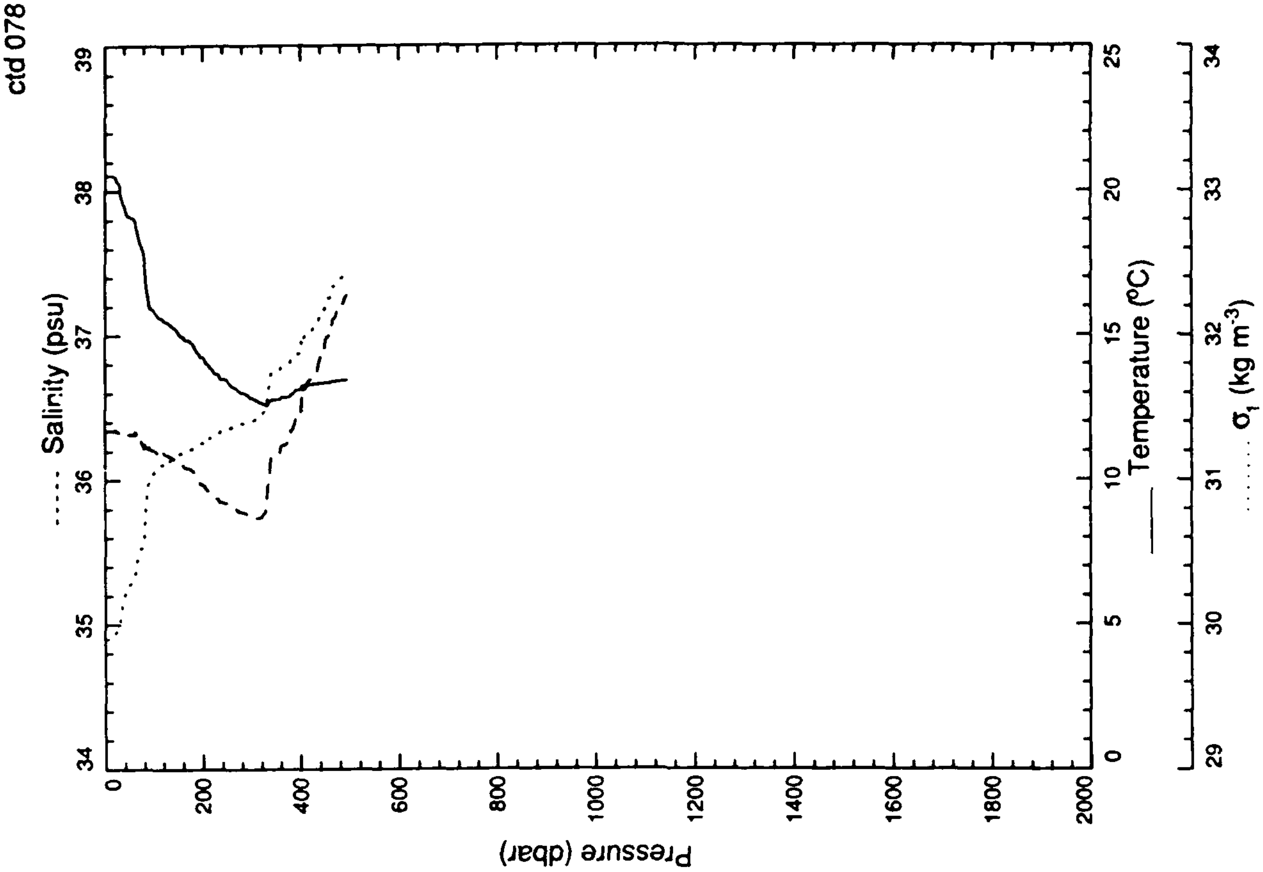

ctd 071
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

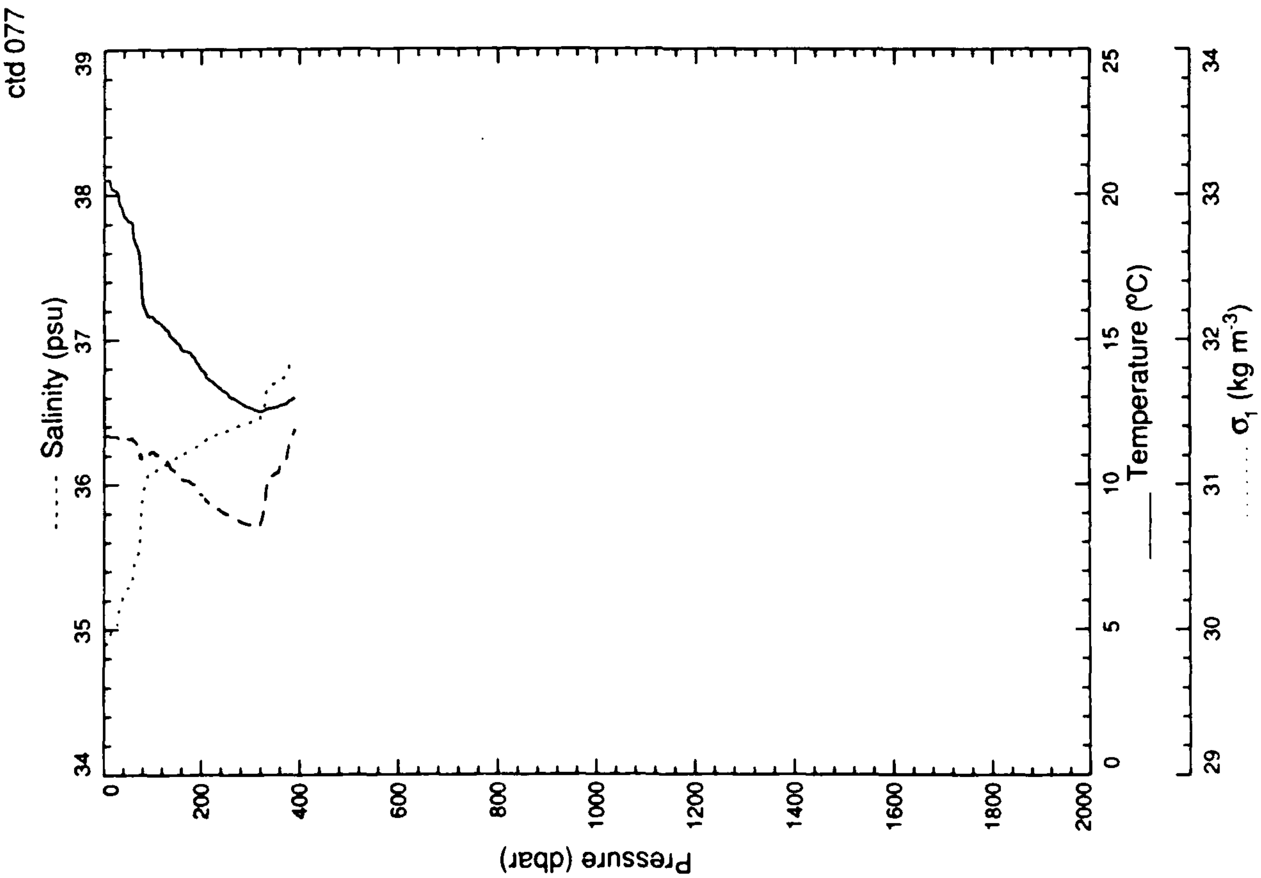

ctd 073
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (ºC)
0
5
10
15
20
25
29
30
31
32
33
34
σ_1 (kg m^{-3})

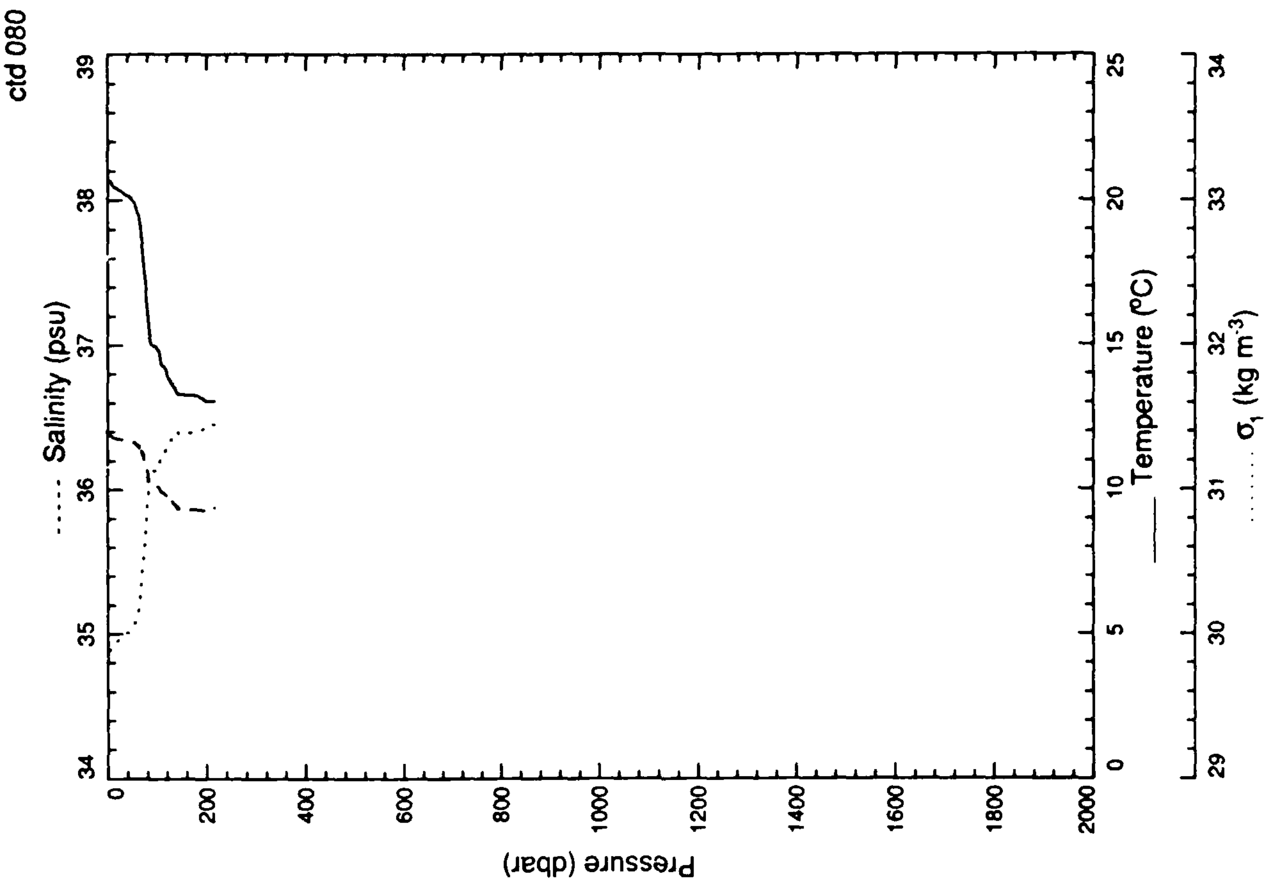

ctd 074
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (ºC)
0
5
10
15
20
25
29
30
31
32
33
34
σ_1 (kg m^{-3})

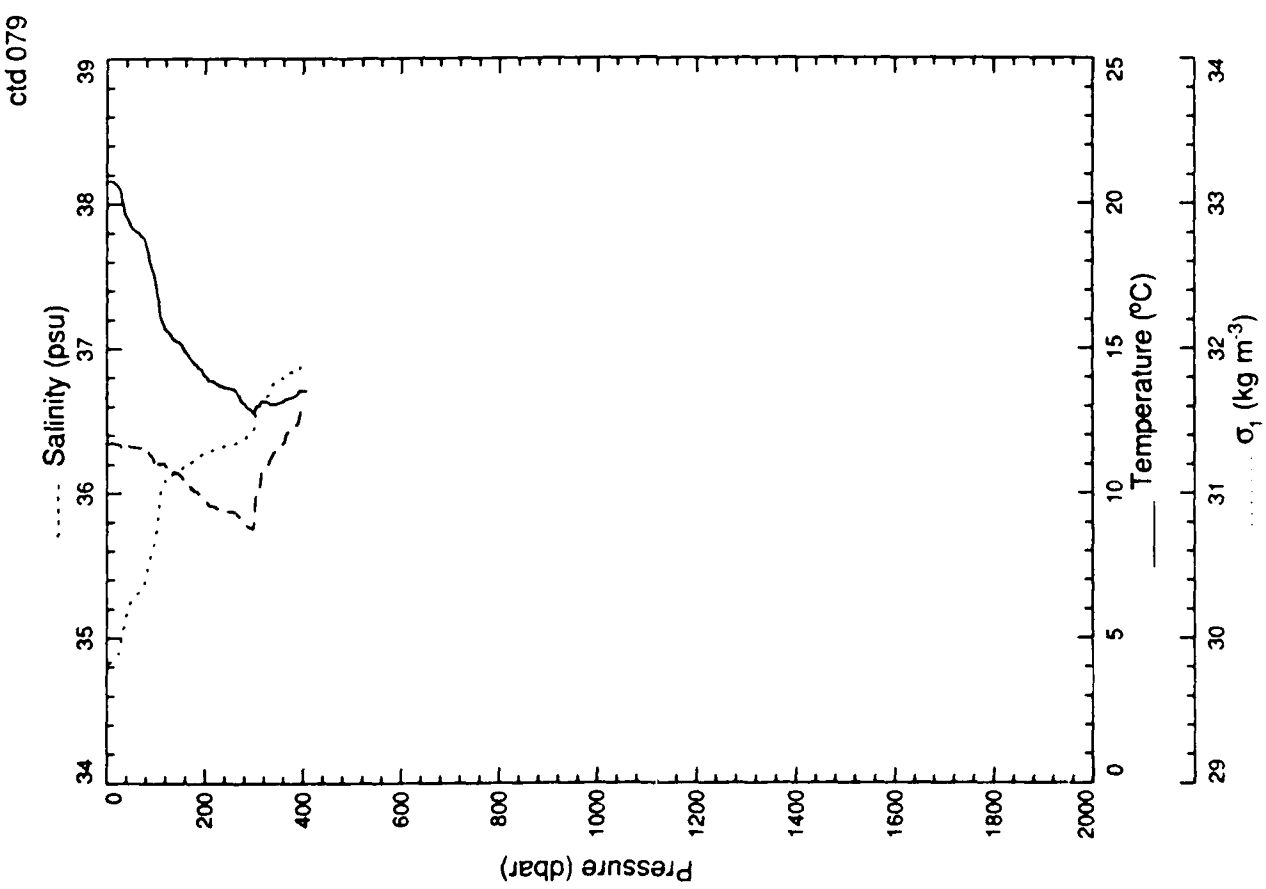

ctd 076
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

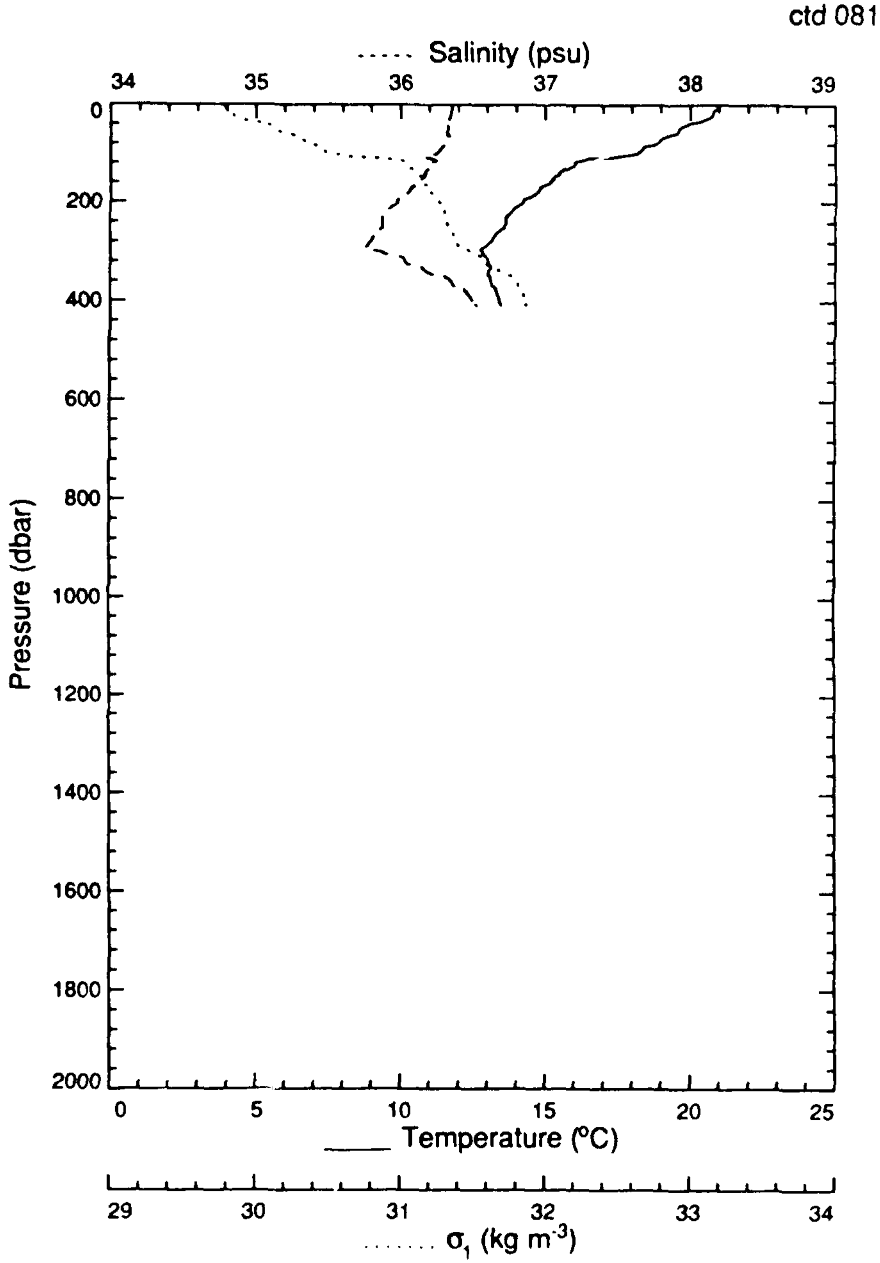

ctd 075
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000


ctd 078
Salinity (psu)
34
35
36
37
38
39
Temperature (°C)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

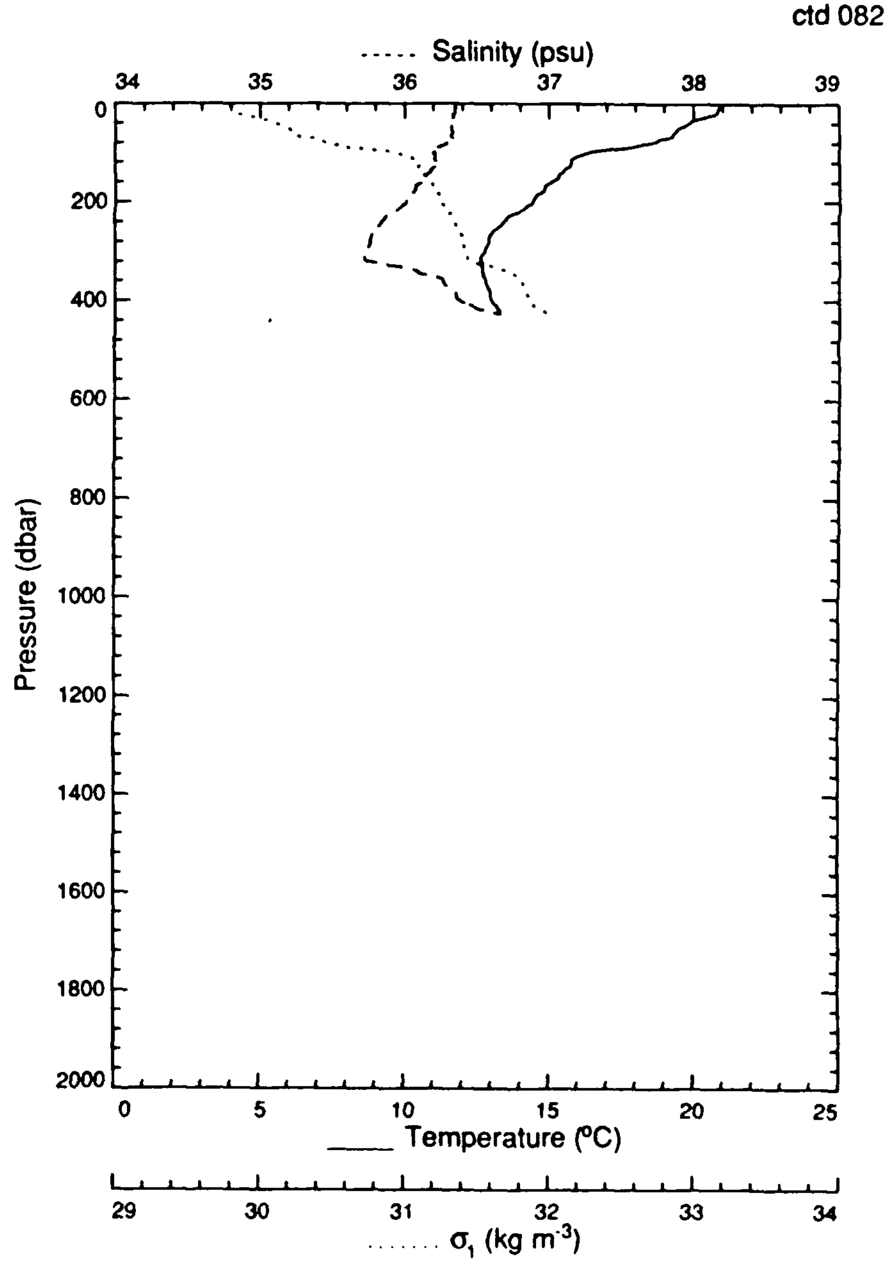

ctd 077
Salinity (psu)
34
35
36
37
38
39
Temperature (°C)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000


ctd 080
Salinity (psu)
34
35
36
37
38
39
Temperature (ºC)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

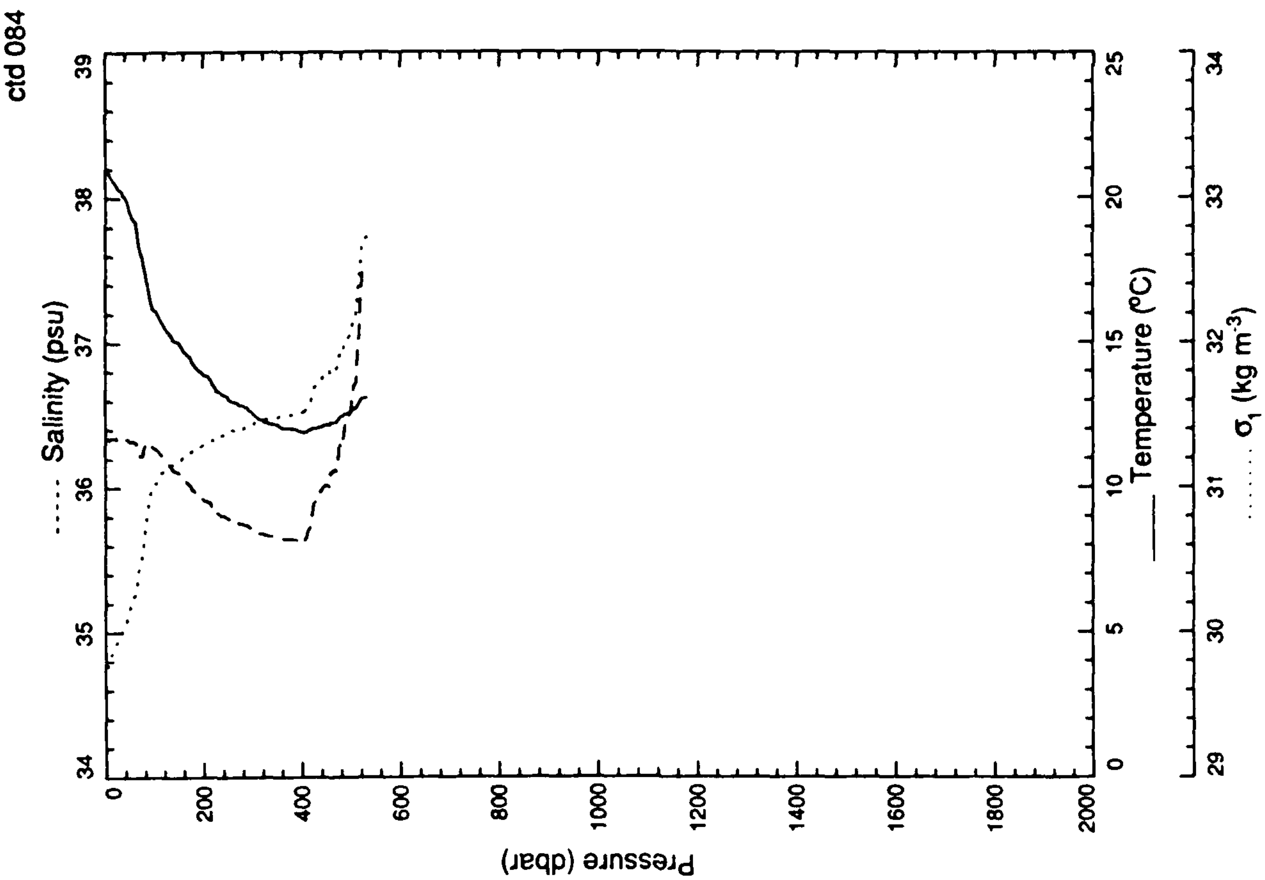

ctd 079
Salinity (psu)
34
35
36
37
38
39
Temperature (ºC)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

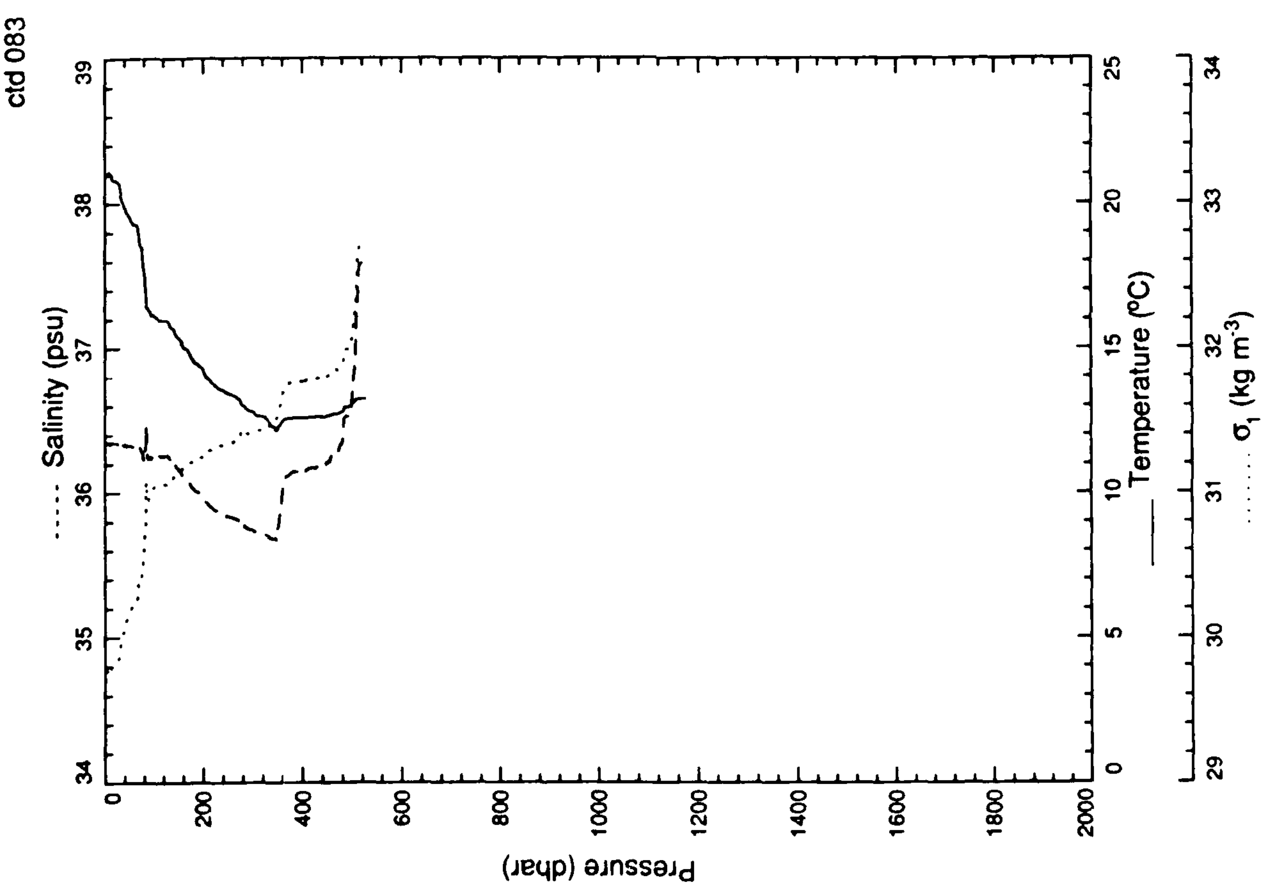


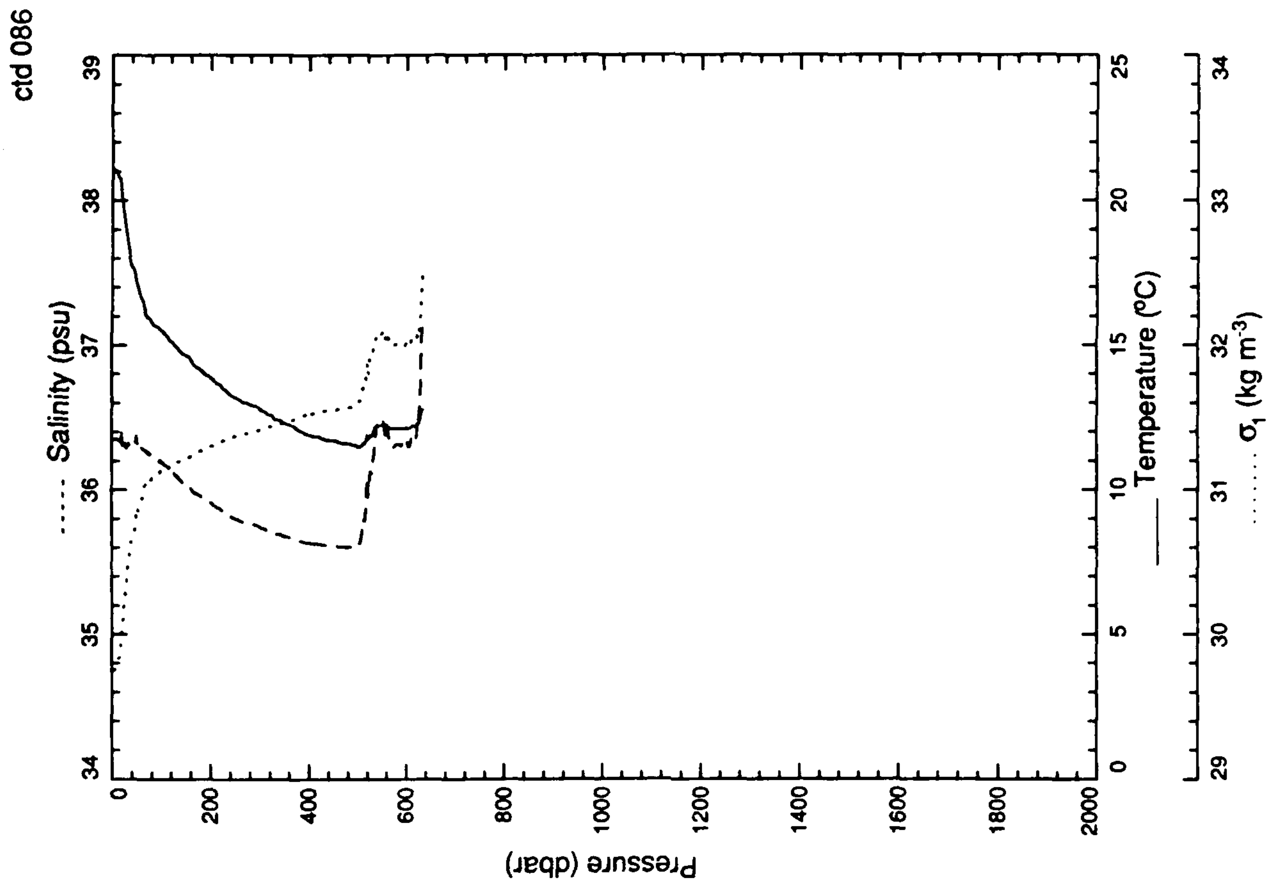
ctd 081
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ1 (kg m-3)

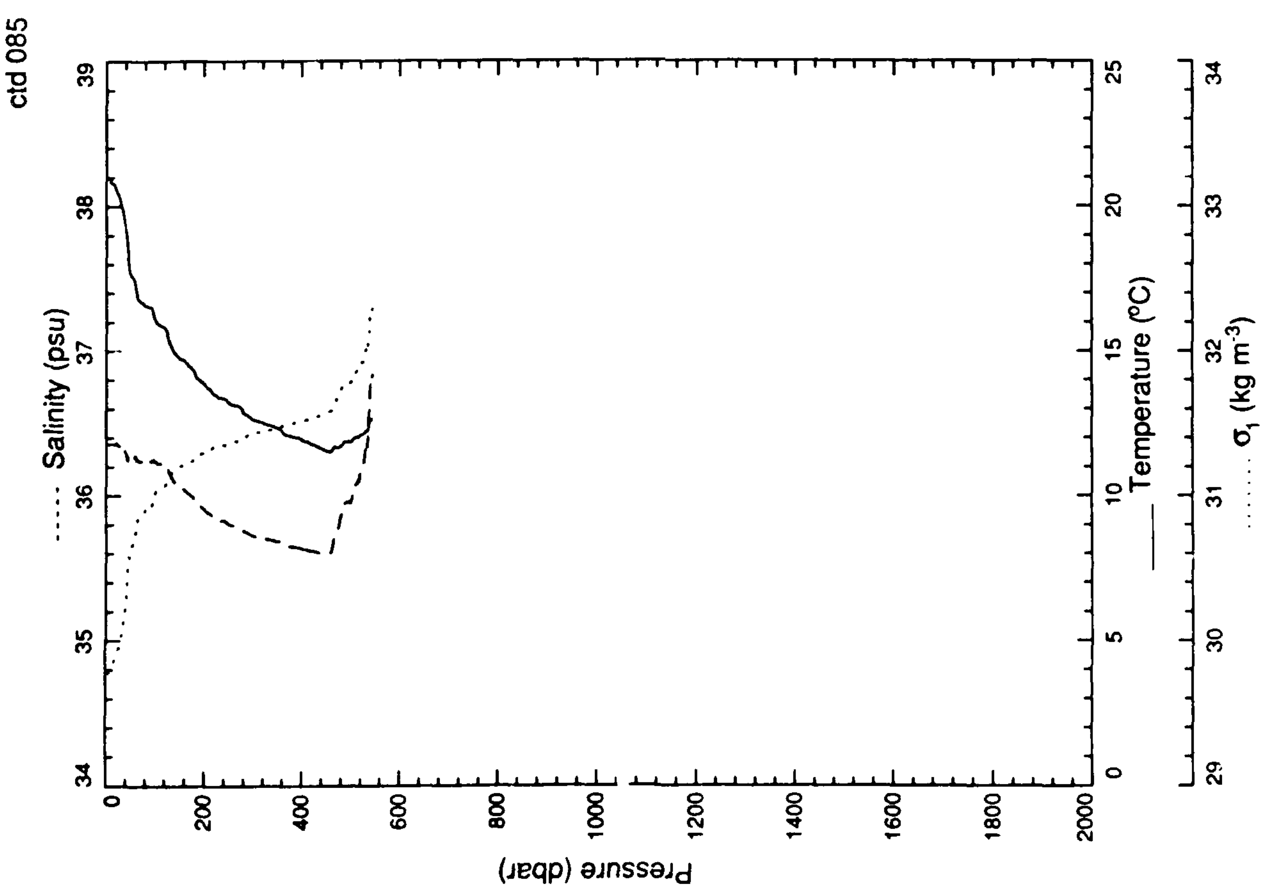


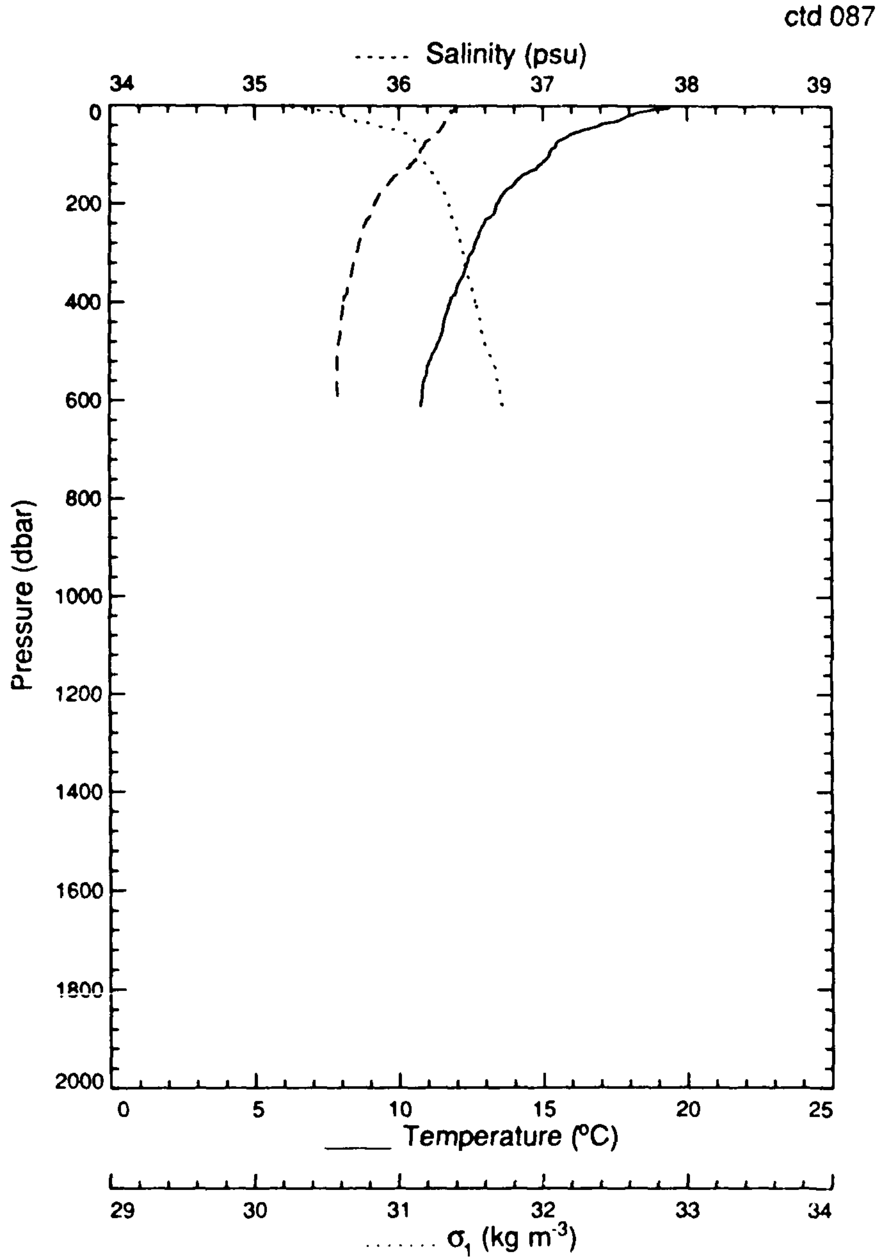
ctd 082
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ1 (kg m-3)

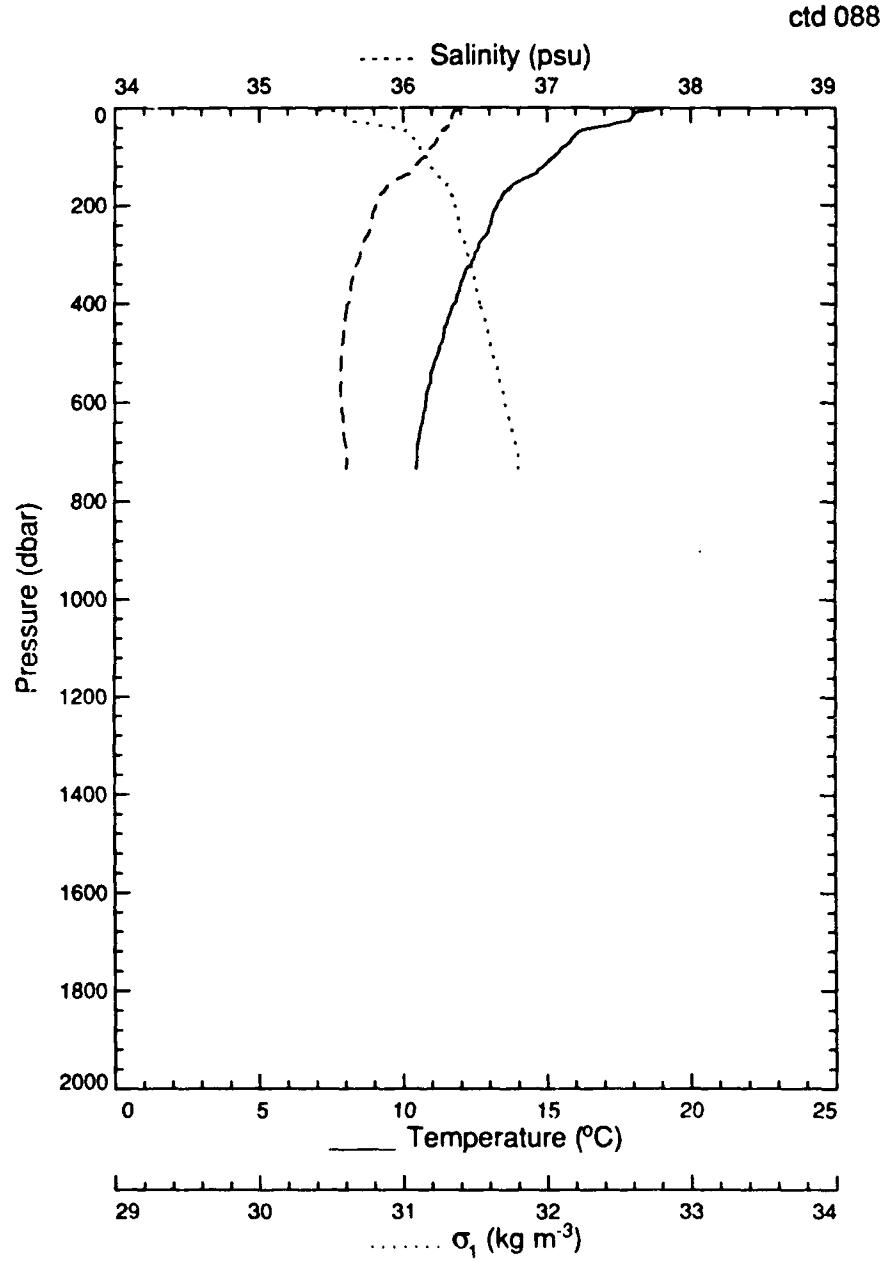

ctd 084
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

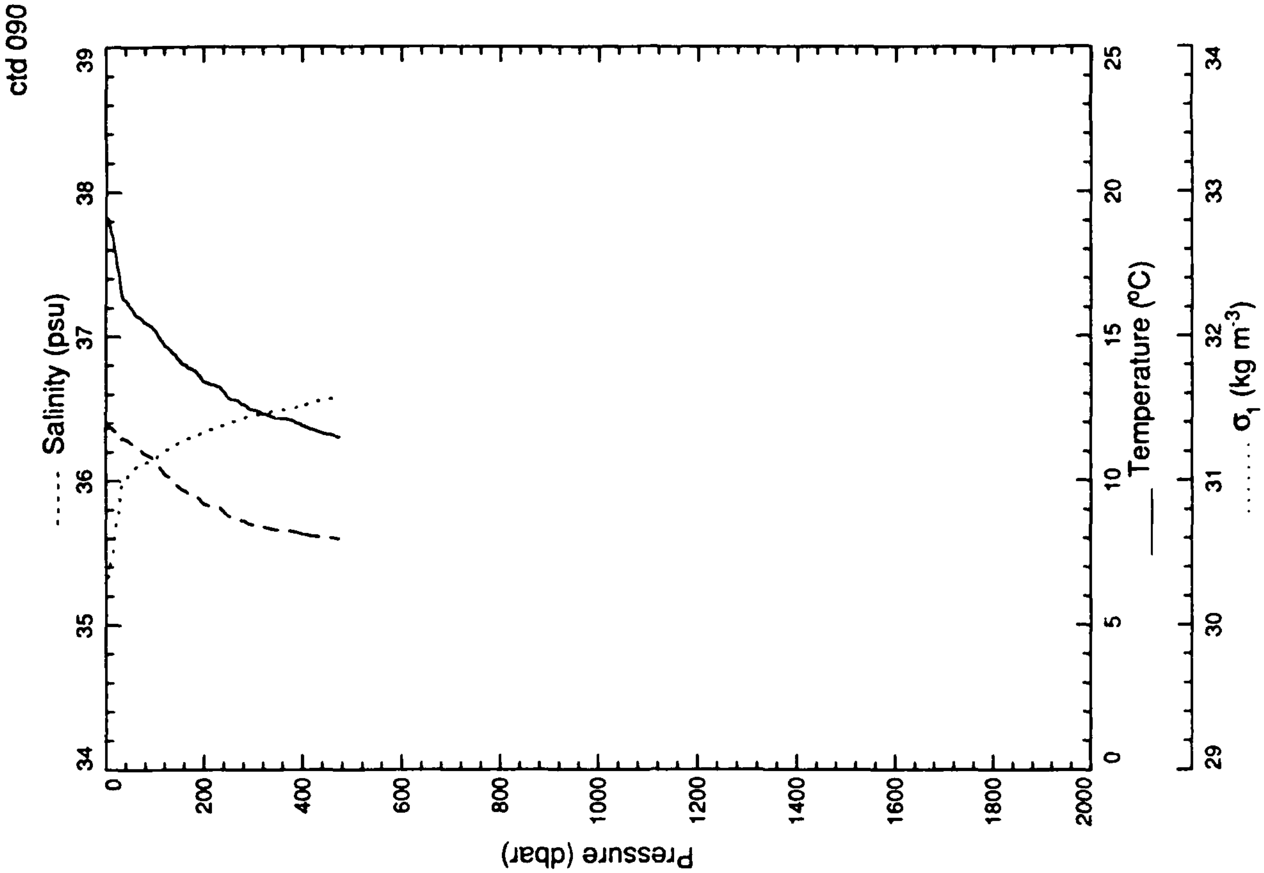

ctd 083
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

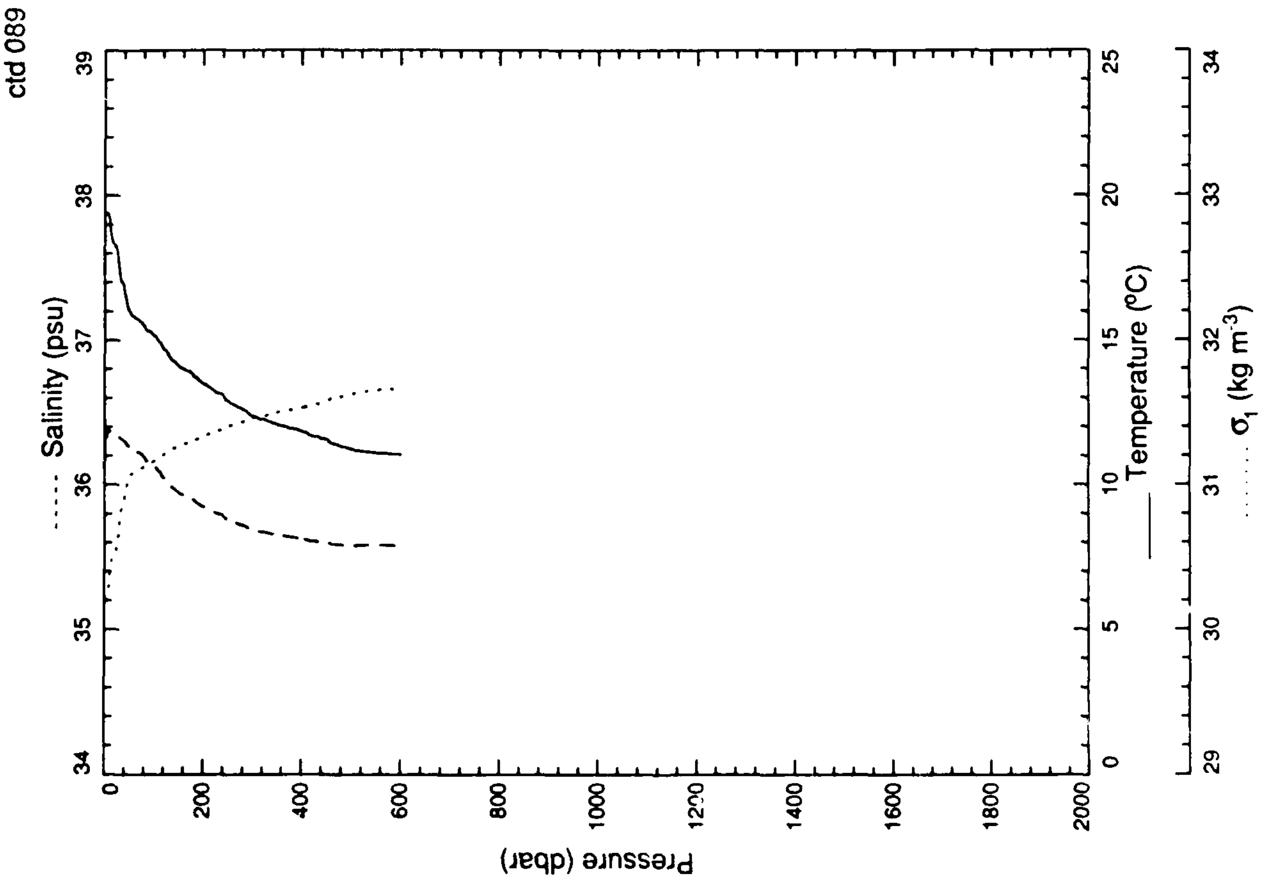

ctd 086
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (ºC)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34

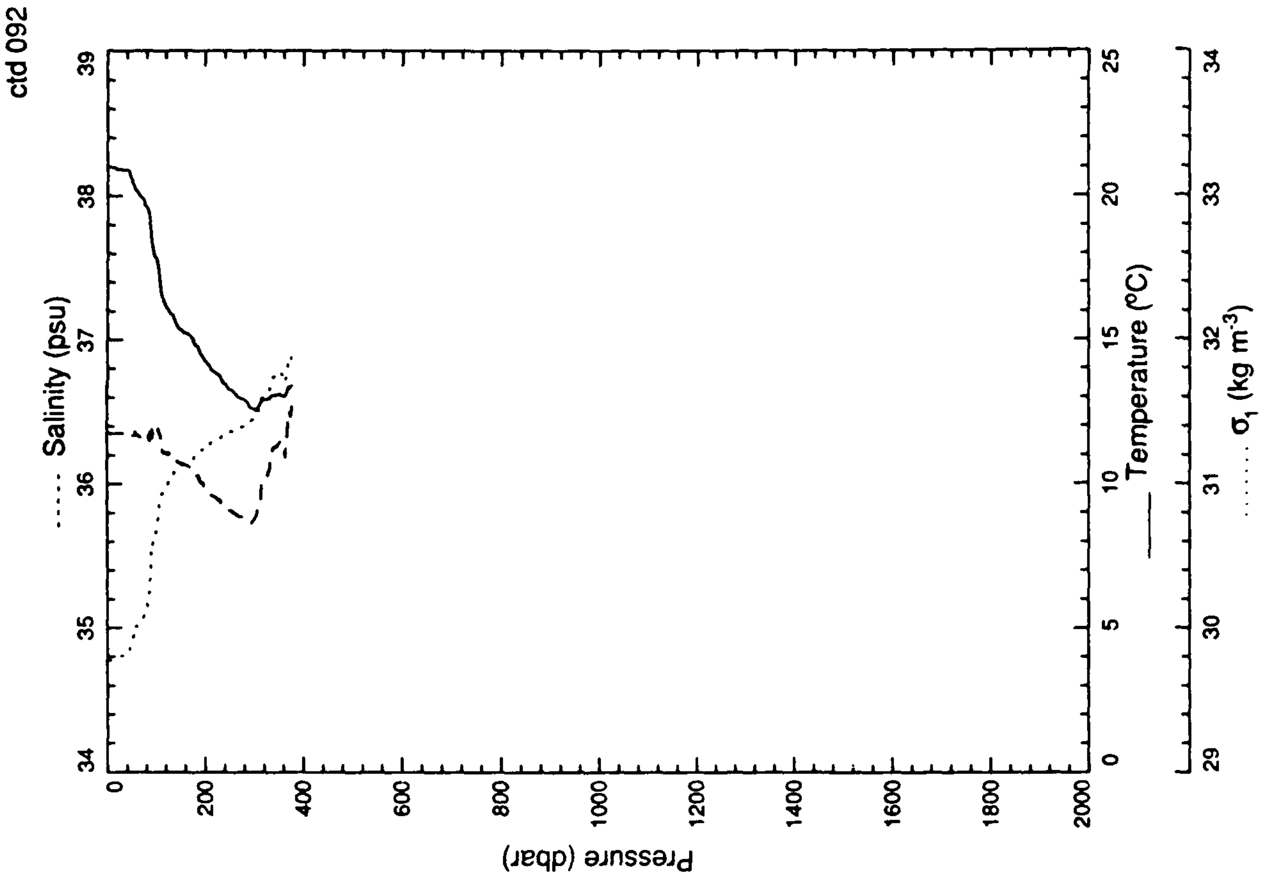

ctd 085
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (ºC)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34

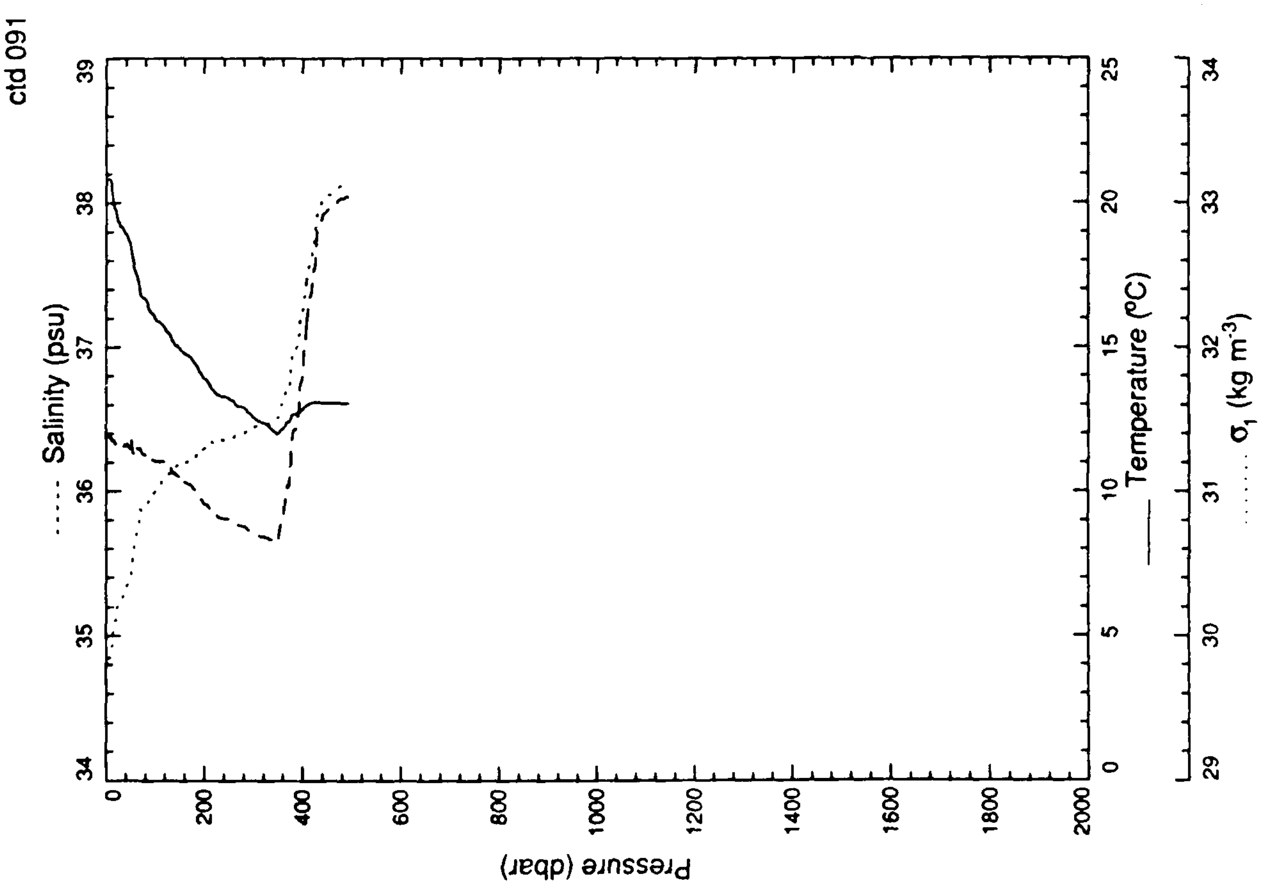

ctd 087
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ1 (kg m-3)

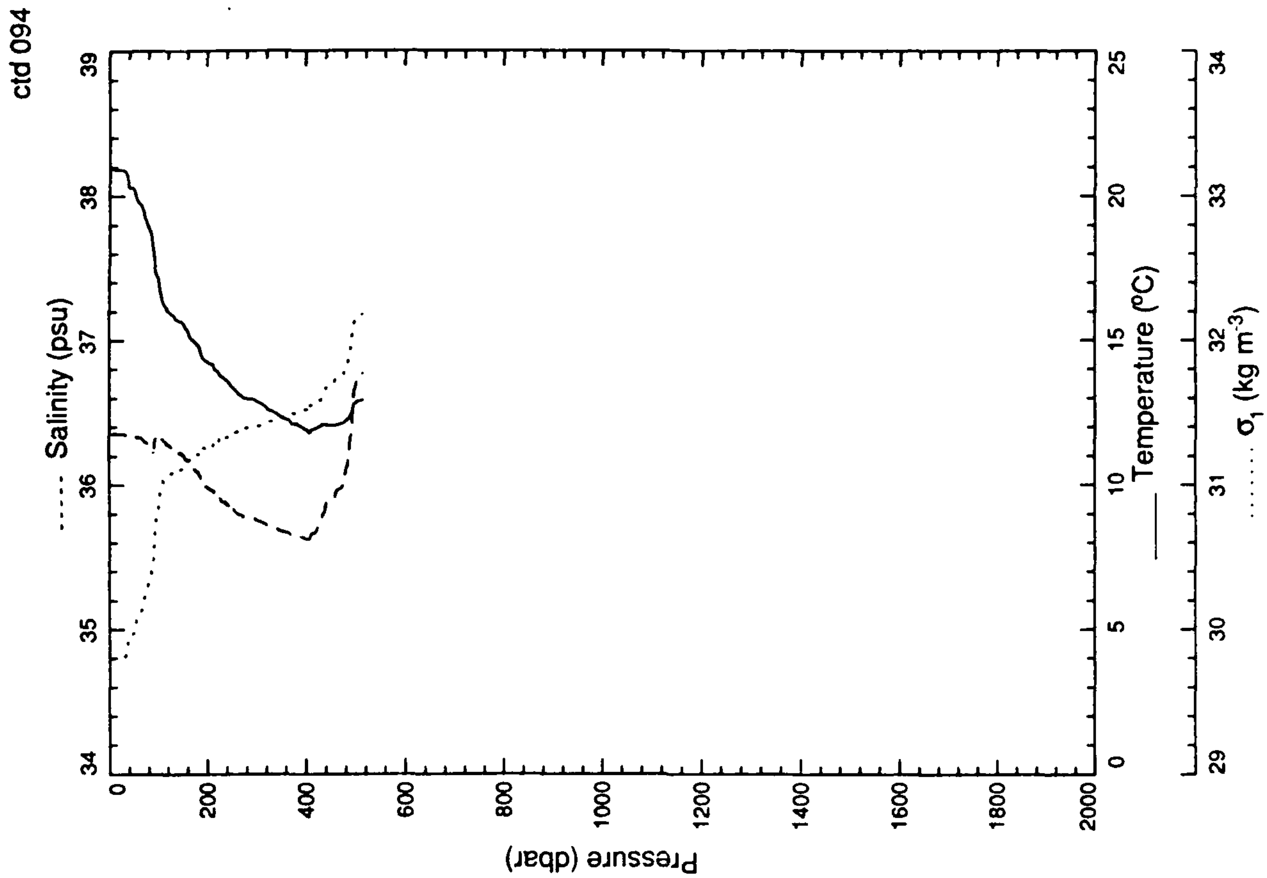

ctd 088
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ1 (kg m-3)


ctd 090
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

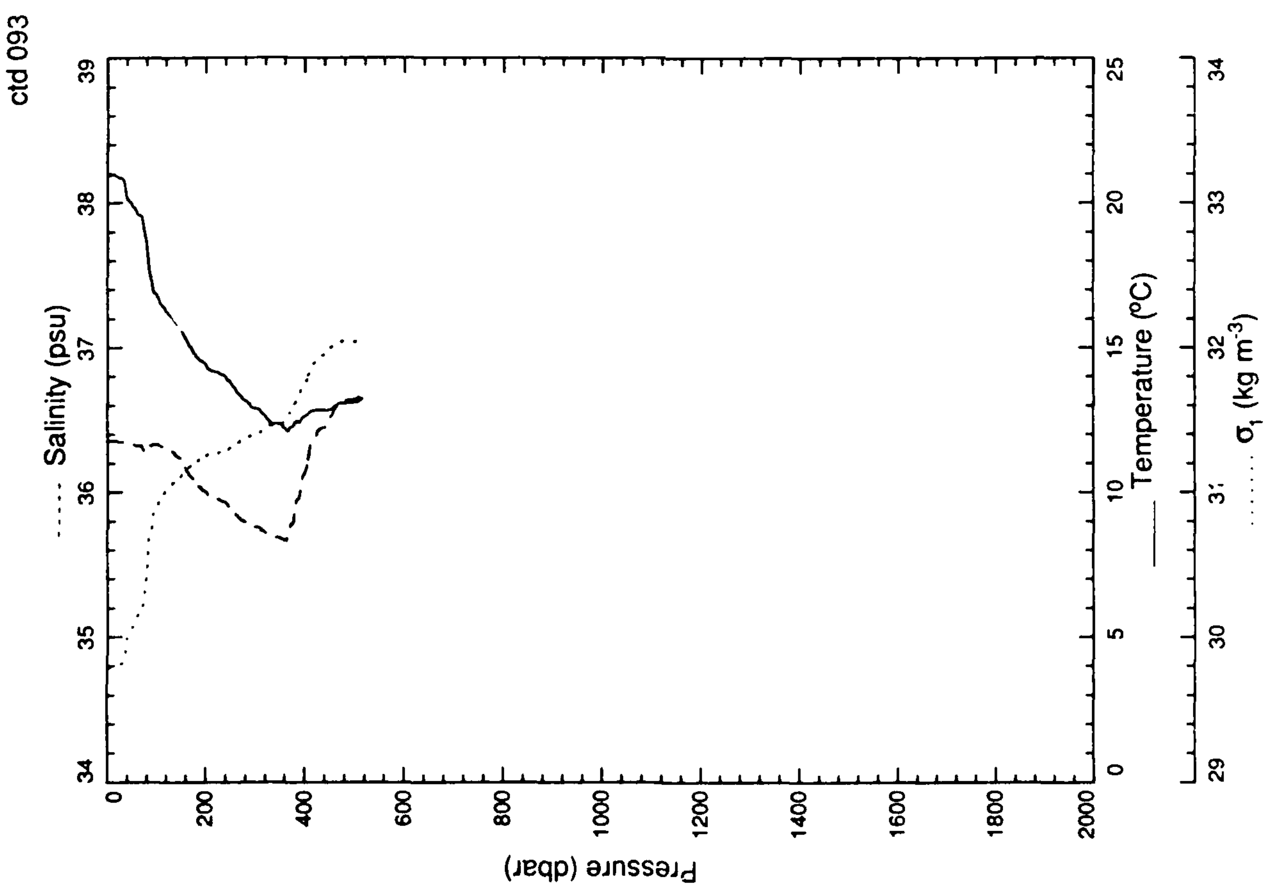

ctd 089
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000


ctd 092
Salinity (psu)
34
35
36
37
38
39
Temperature (°C)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

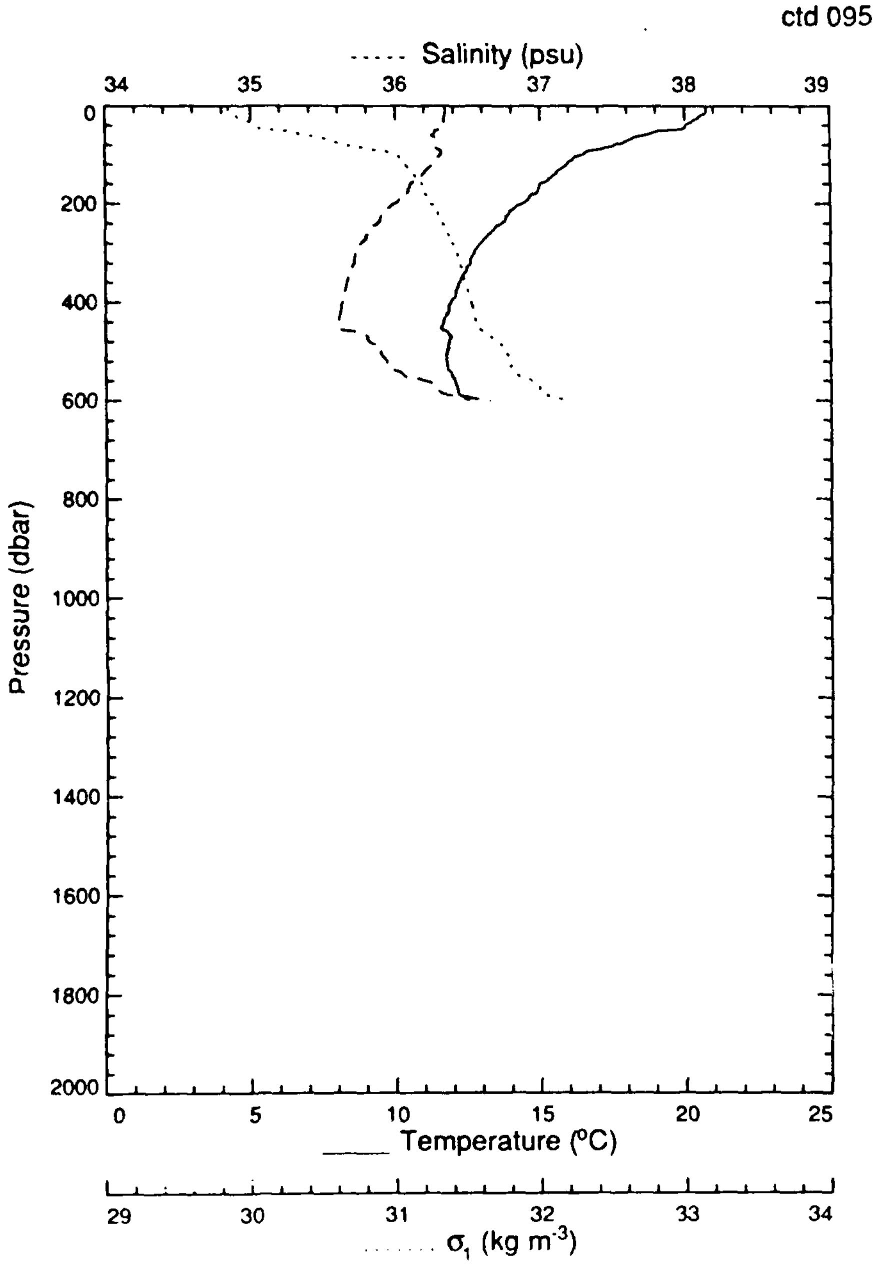

ctd 091
Salinity (psu)
34
35
36
37
38
39
Temperature (°C)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

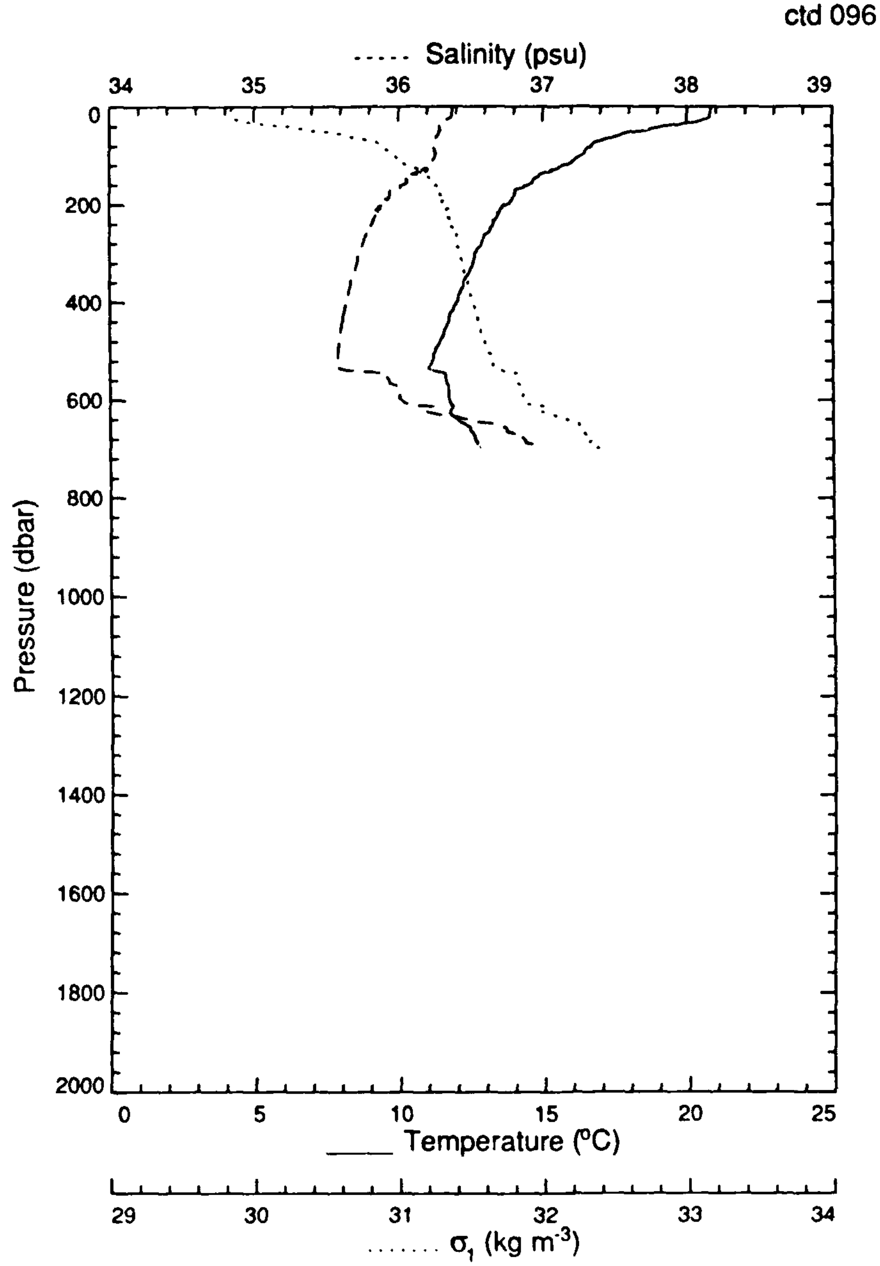


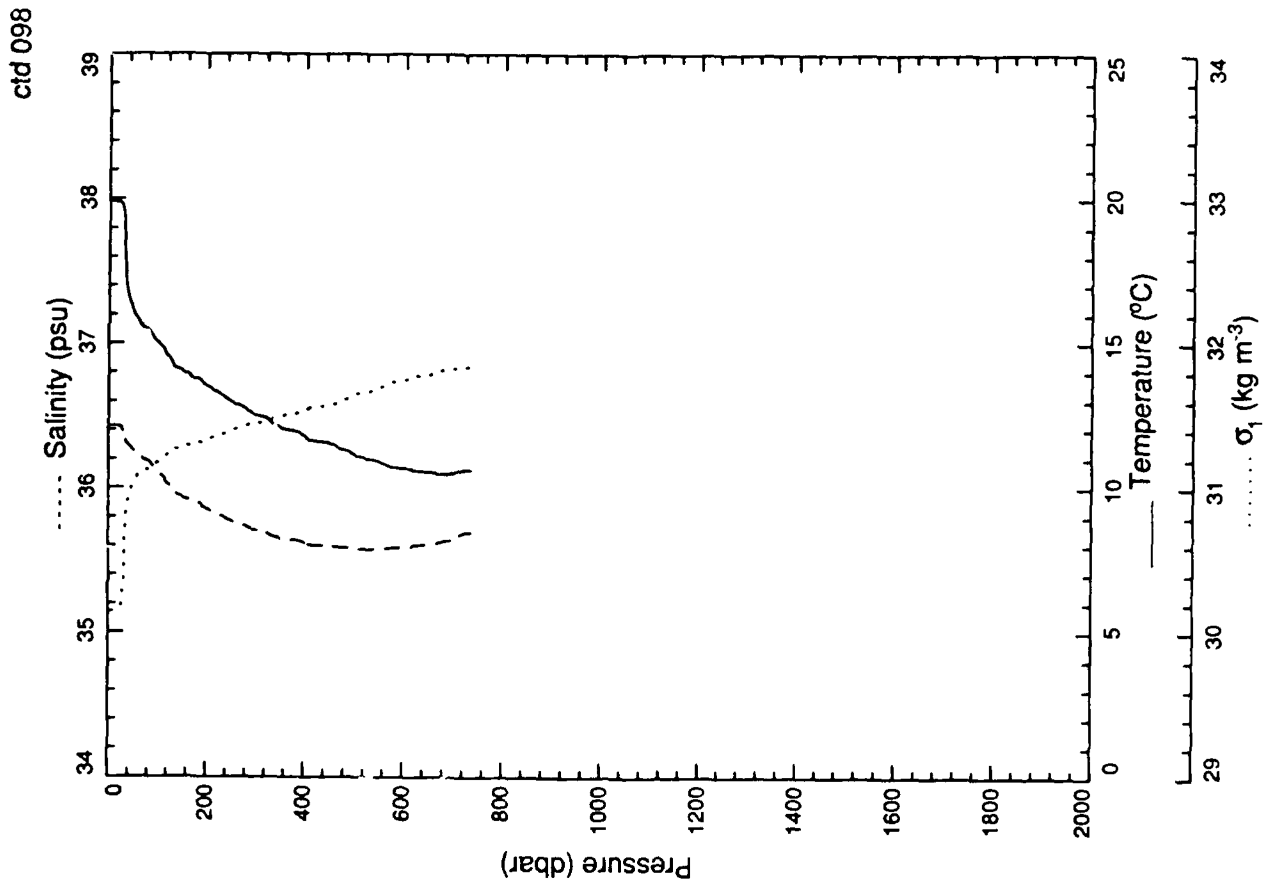
ctd 094
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (ºC)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34

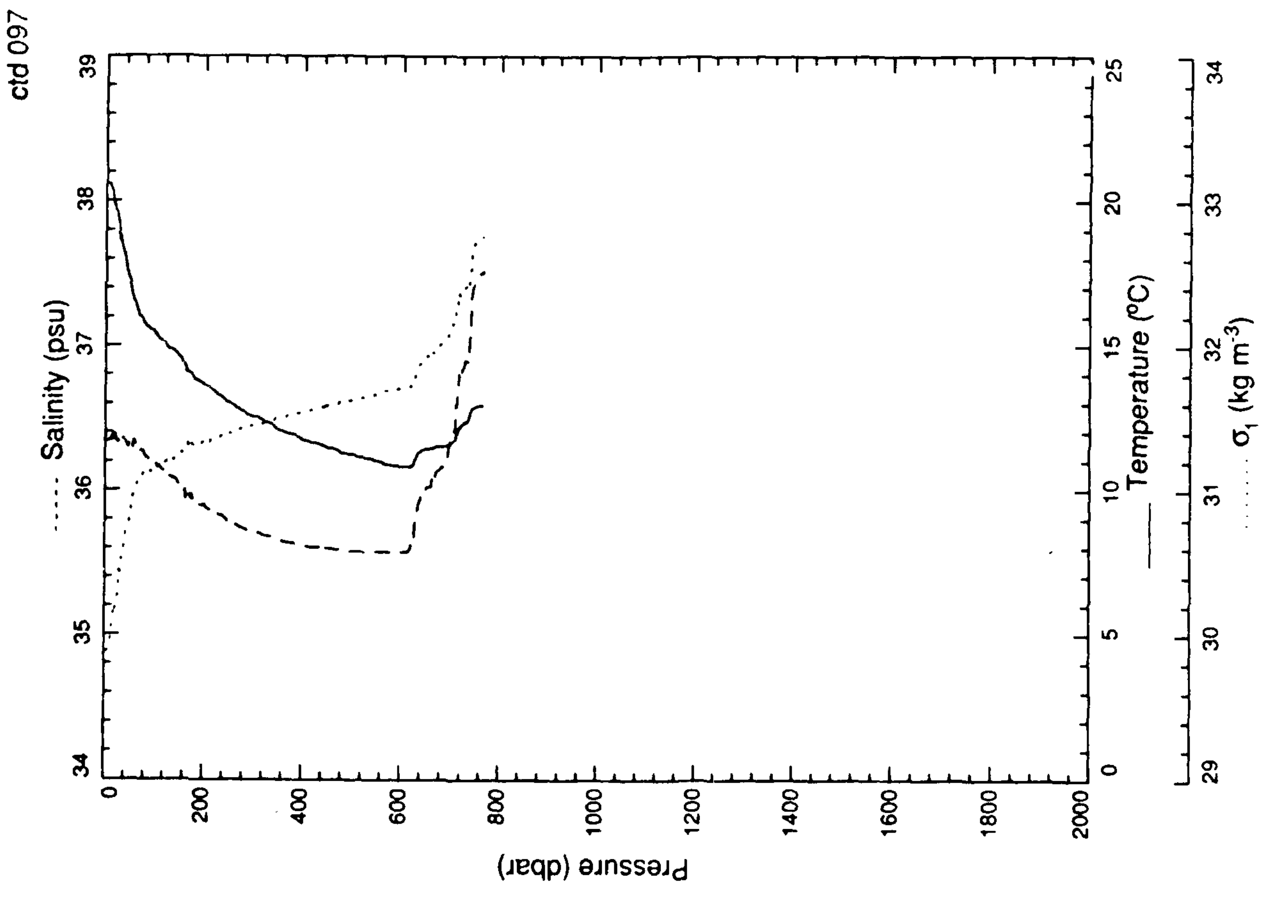


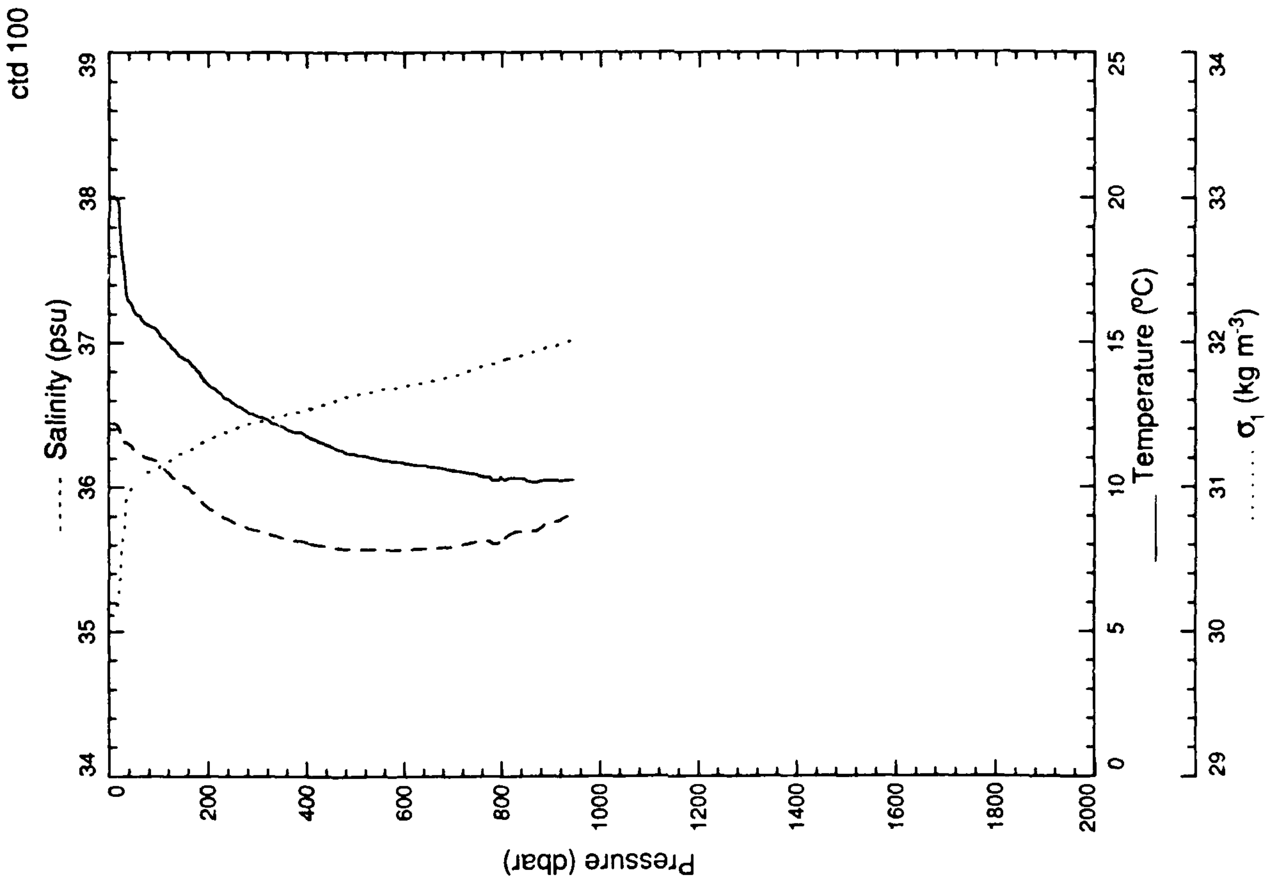
ctd 093
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (ºC)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34

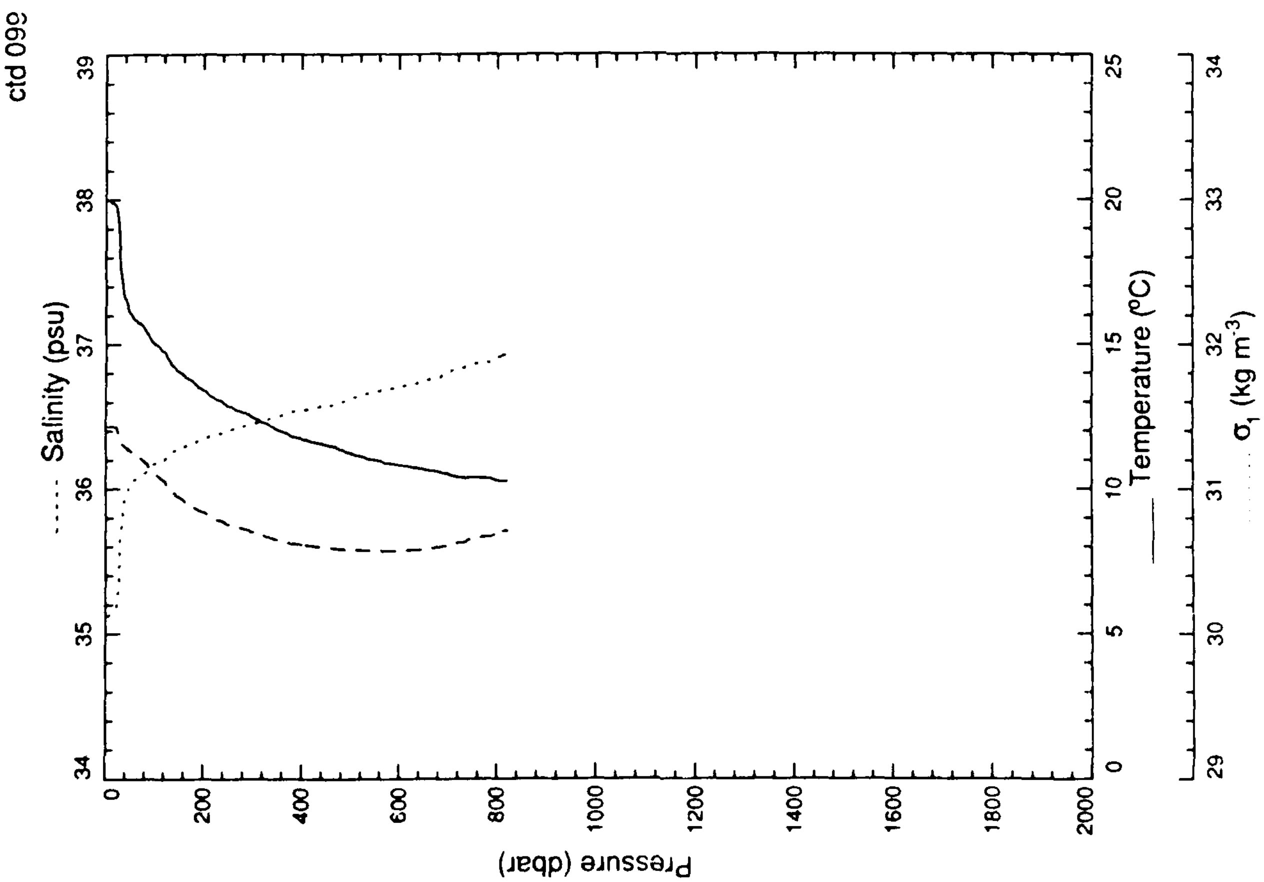

ctd 095
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ1 (kg m-3)


ctd 096
Salinity (psu)
Pressure (dbar)
Temperature (°C)
σ1 (kg m-3)


ctd 098
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

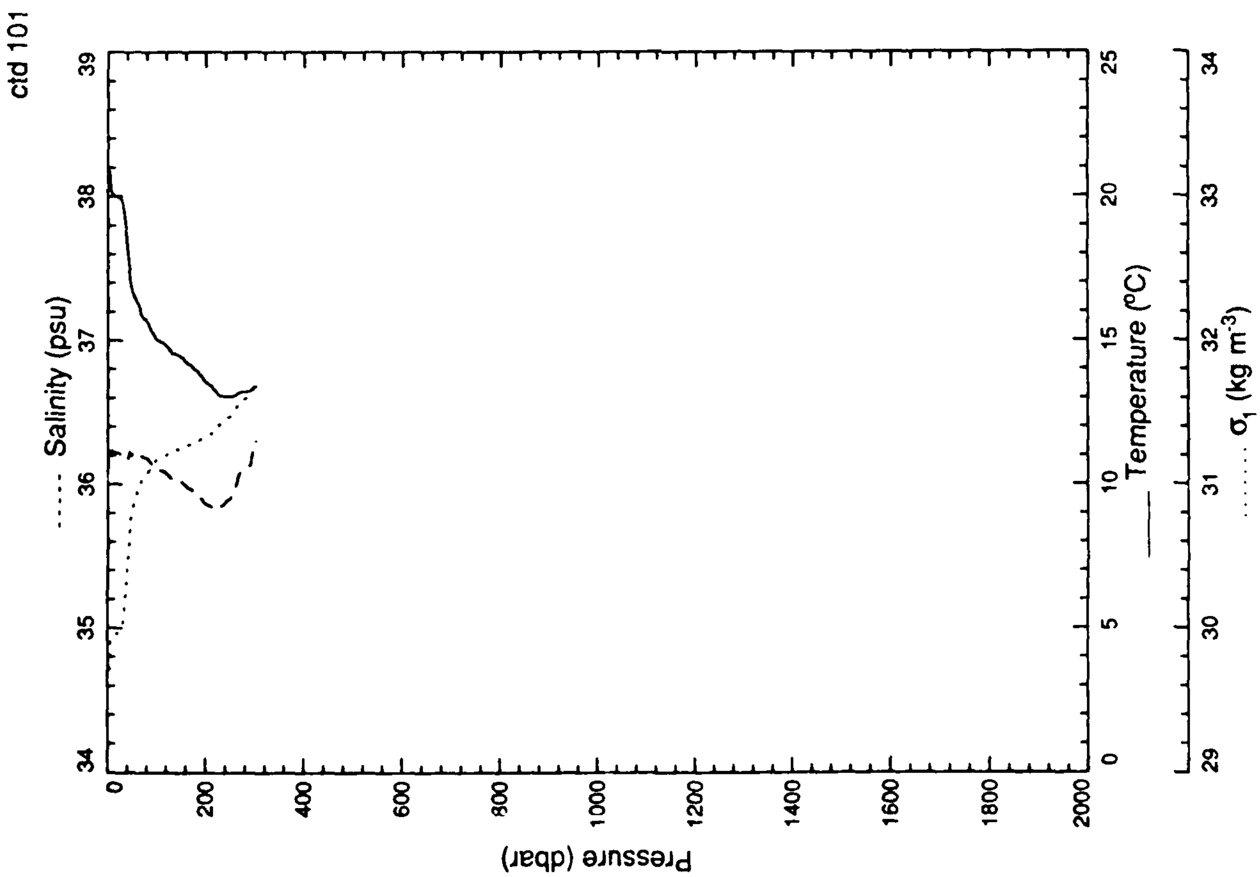

ctd 097
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

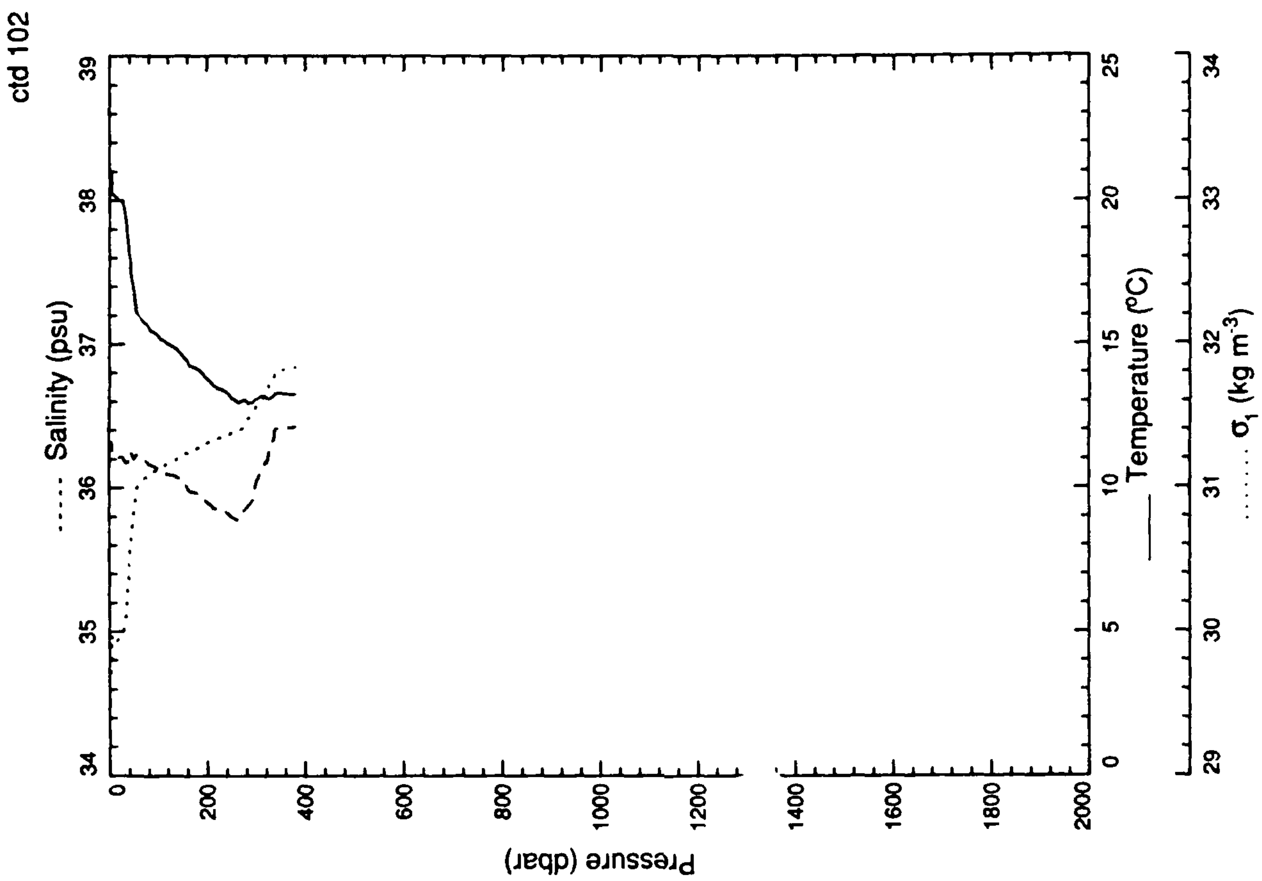

ctd 100
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

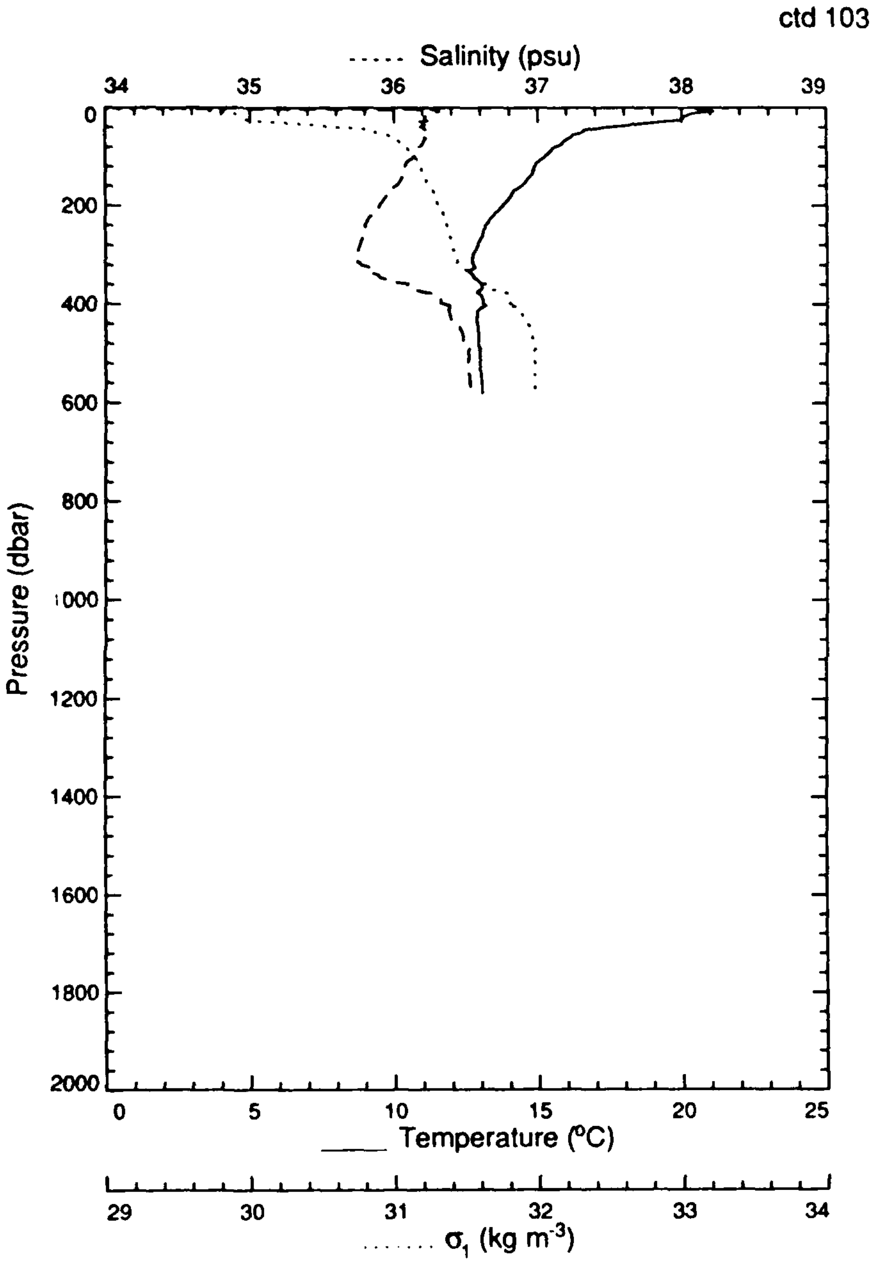

ctd 099
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

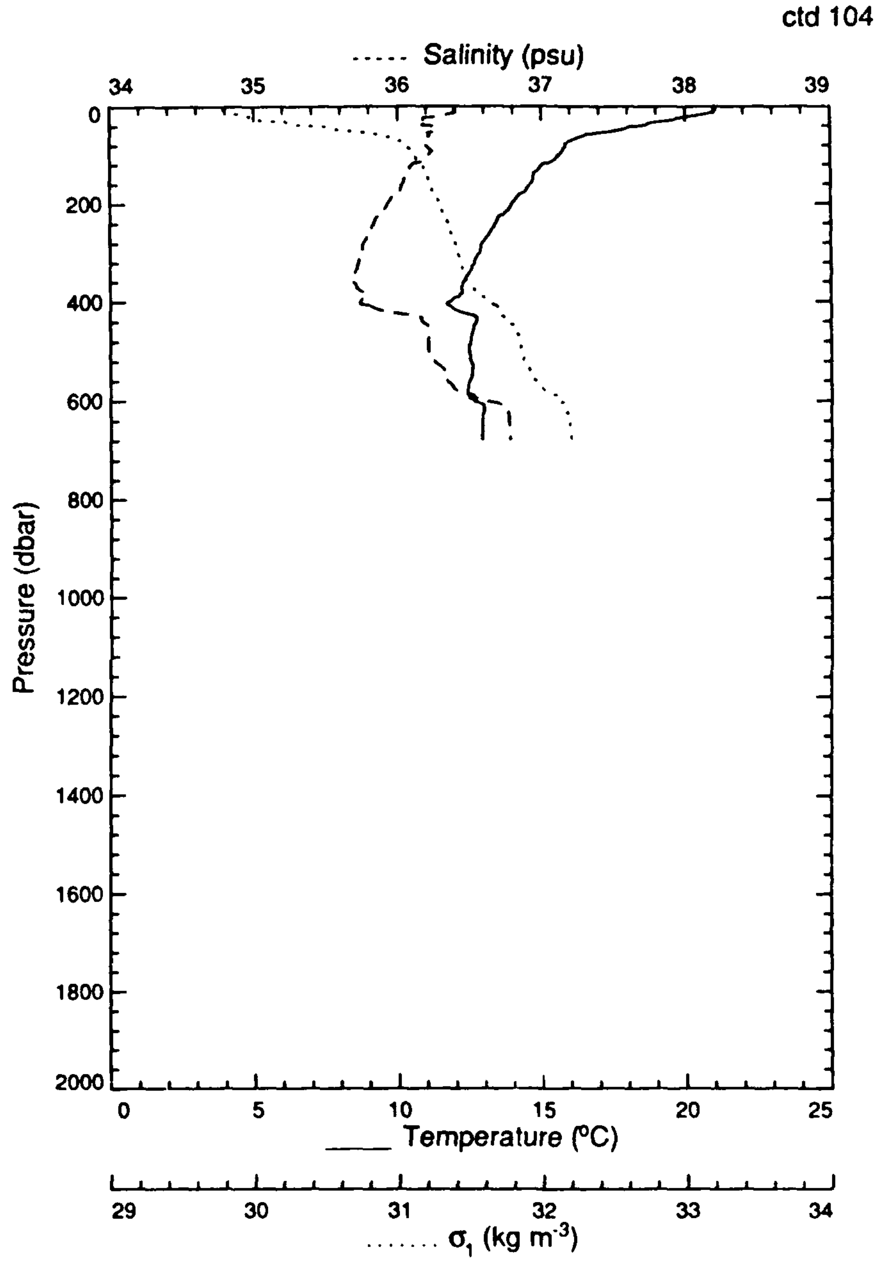
AD-A208 171 CTD (CONDUCTIVITY-TEMPERATURE-DEPTH) FROM THE GULF OF CADIZ EXPEDITION: R.. (U) WASHINGTON UNIV SEATTLE APPLIED PHYSICS LAB M A KENNELLY ET AL. APR 89 2/2

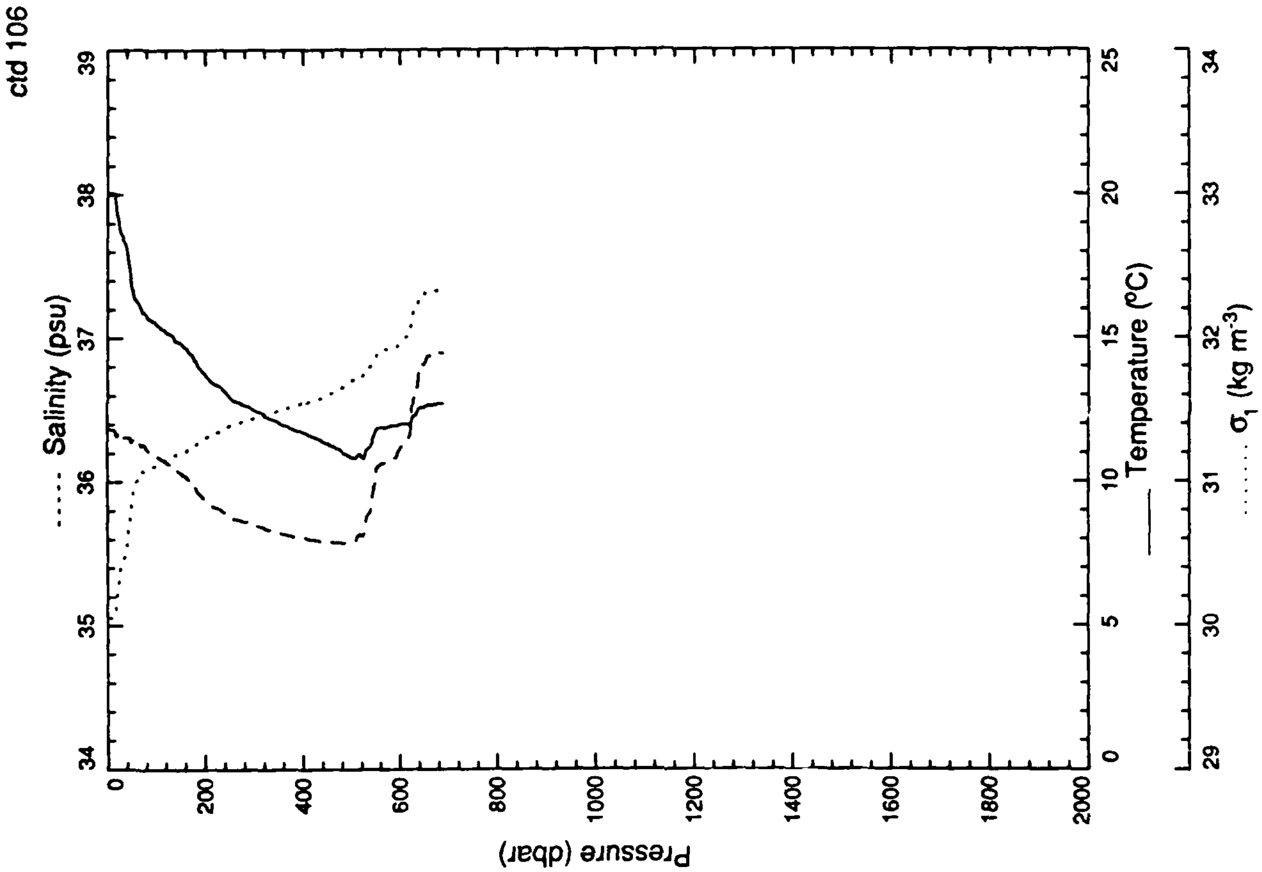
UNCLASSIFIED APL-UW-TR8917 N00014-87-K-0004 F/G 8/3 NL

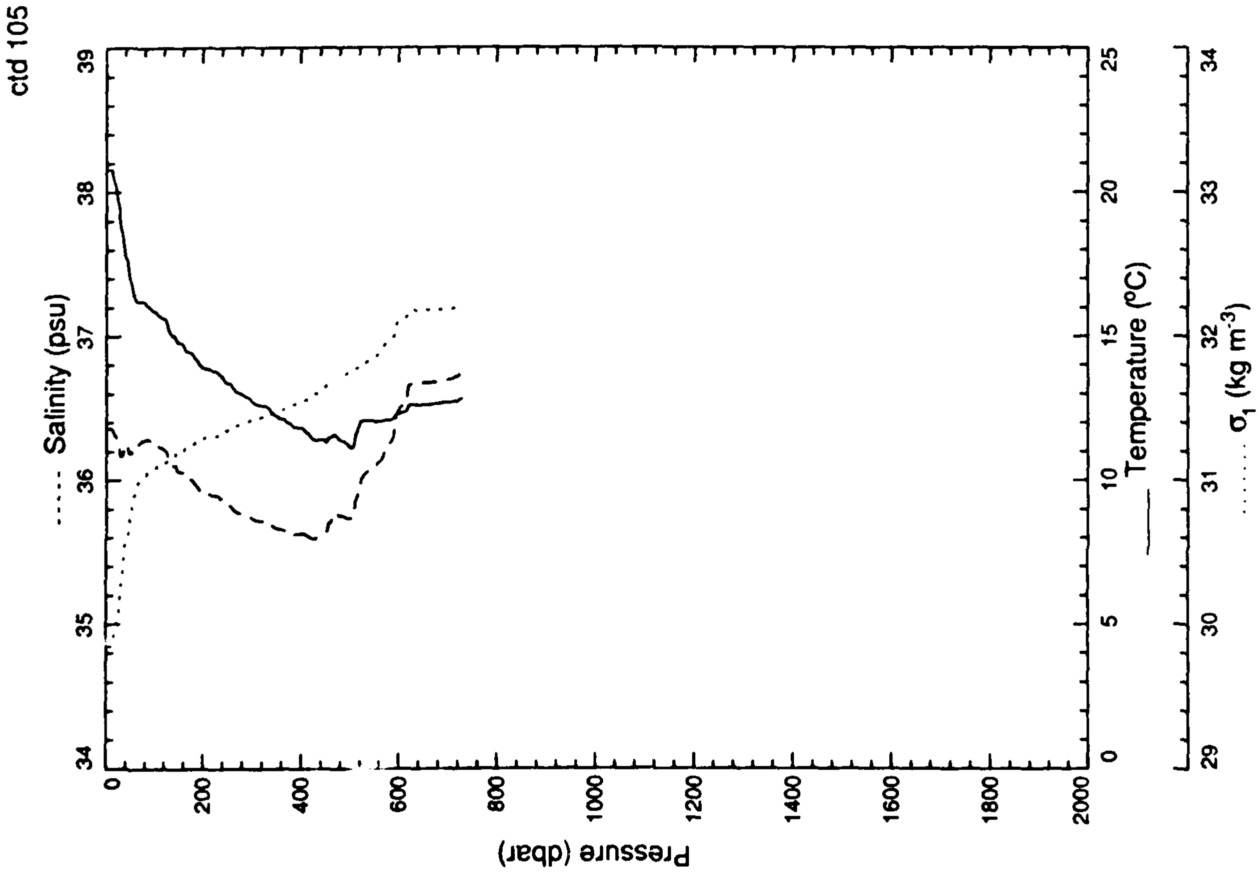

ctd 101
Salinity (psu)
34 35 36 37 38 39
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000
Temperature (°C)
0 5 10 15 20 25
σ_1 (kg m^{-3})
29 30 31 32 33 34

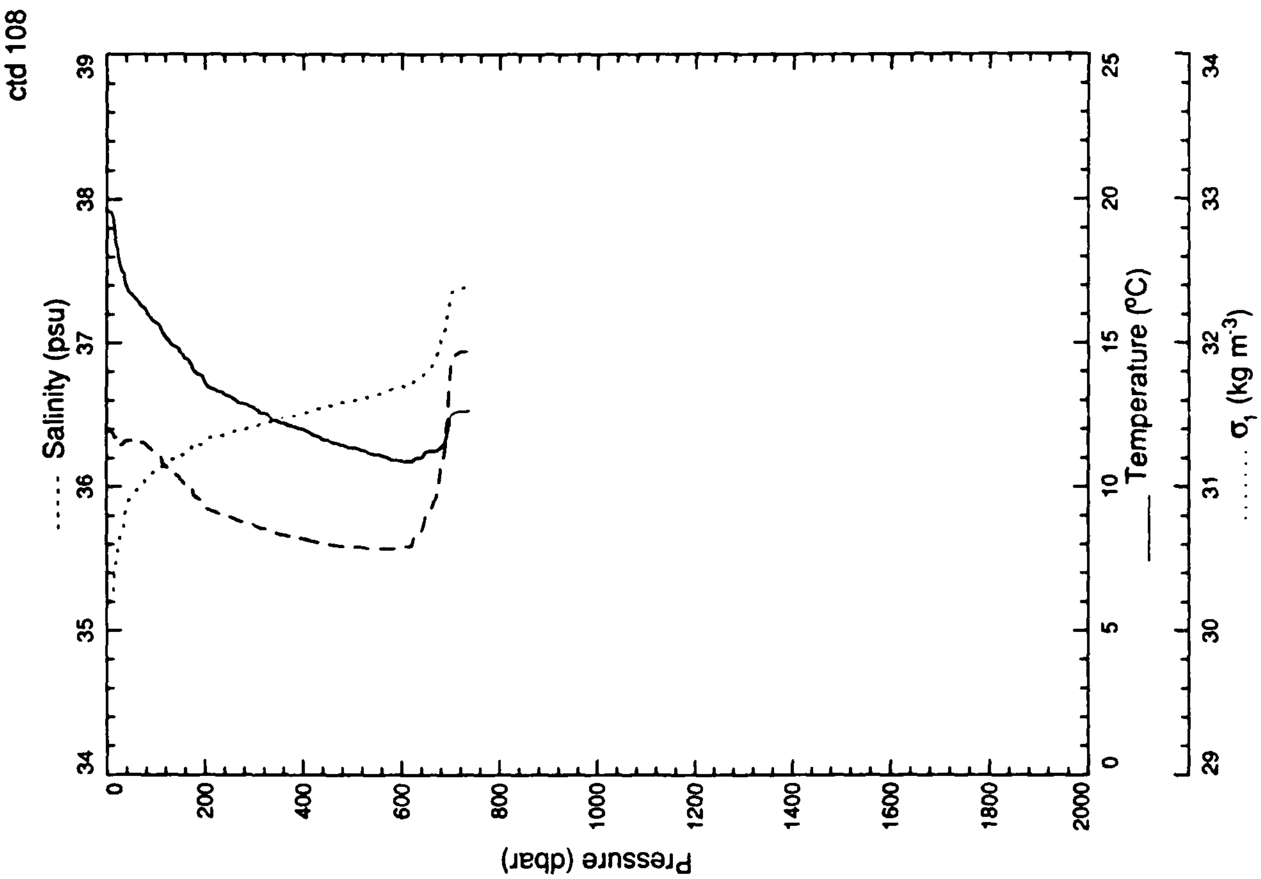

ctd 102
Salinity (psu)
34 35 36 37 38 39
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000
Temperature (°C)
0 5 10 15 20 25
σ_1 (kg m^{-3})
29 30 31 32 33 34

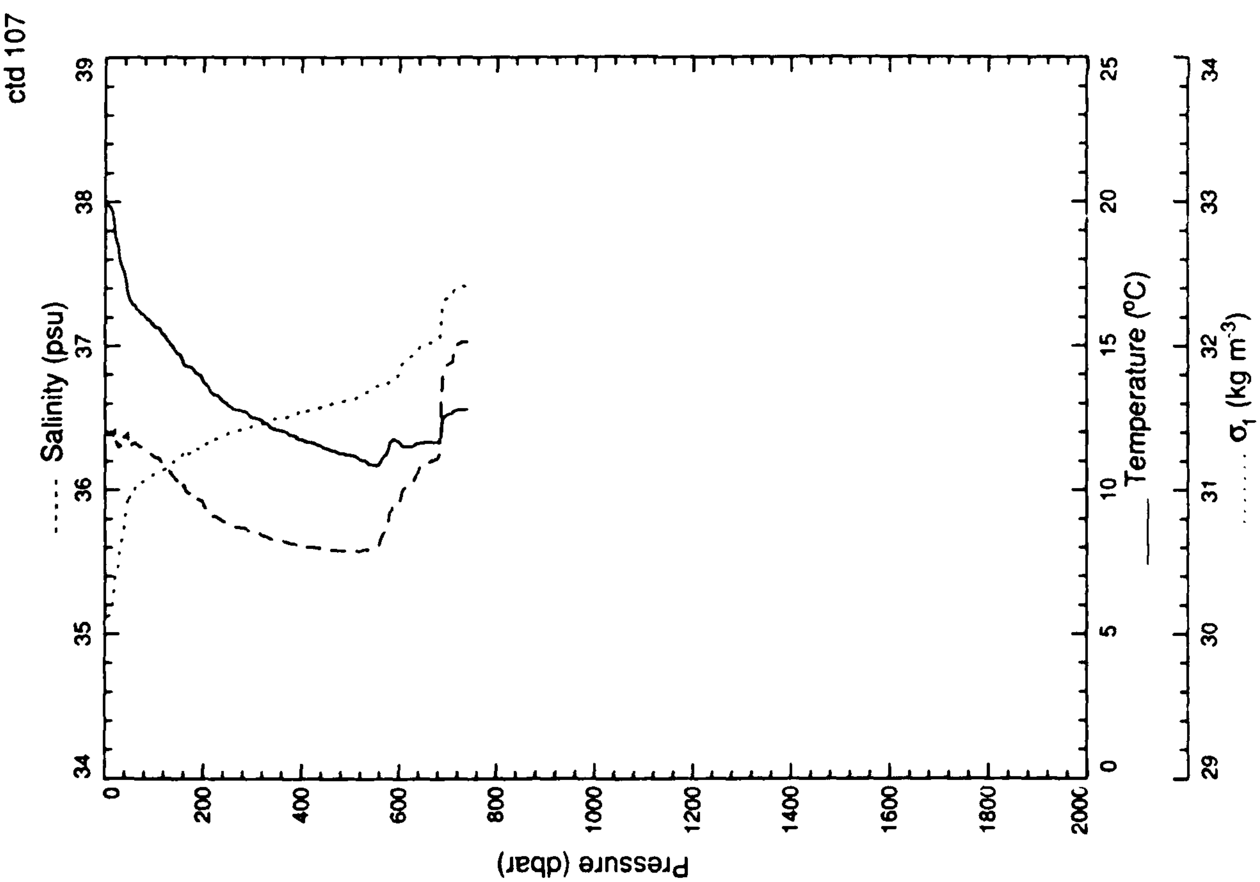

ctd 103
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

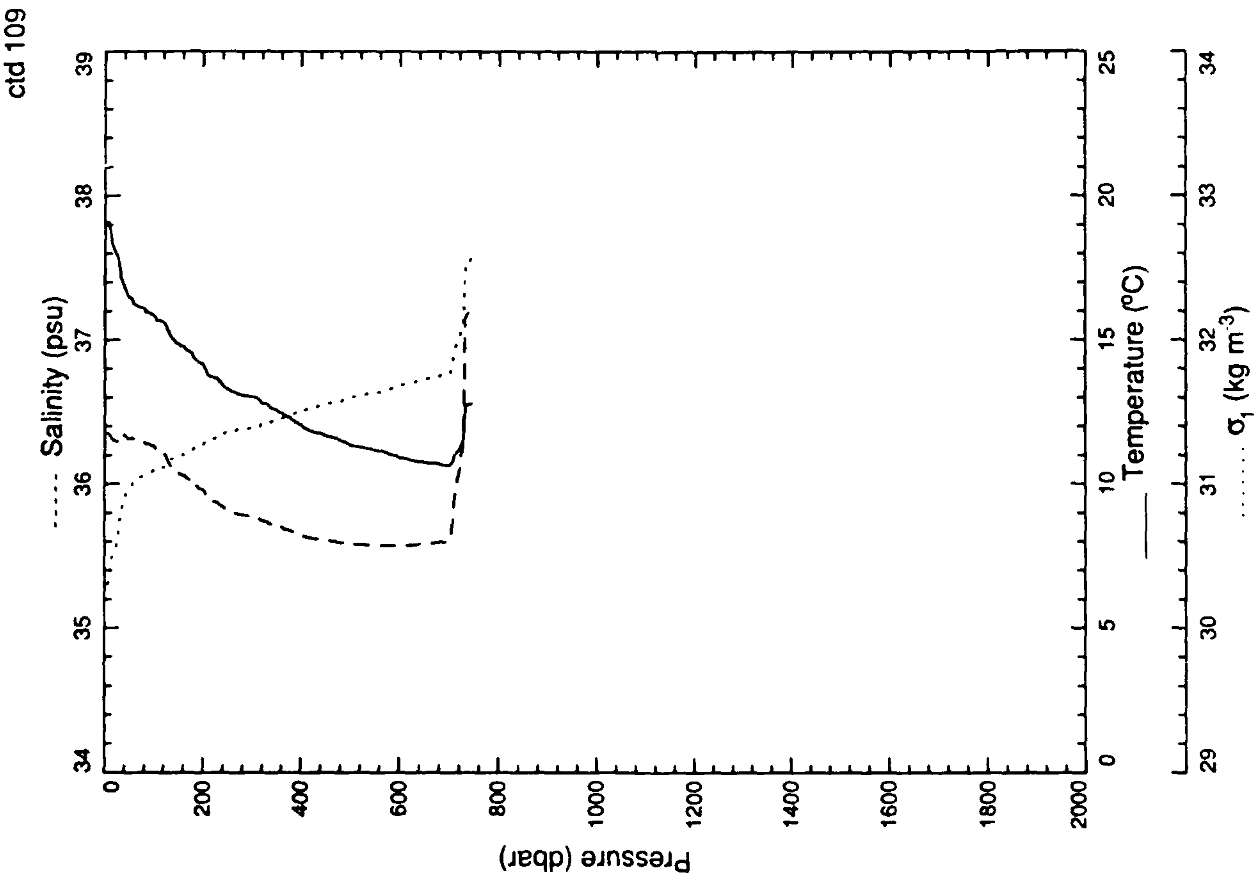

ctd 104
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

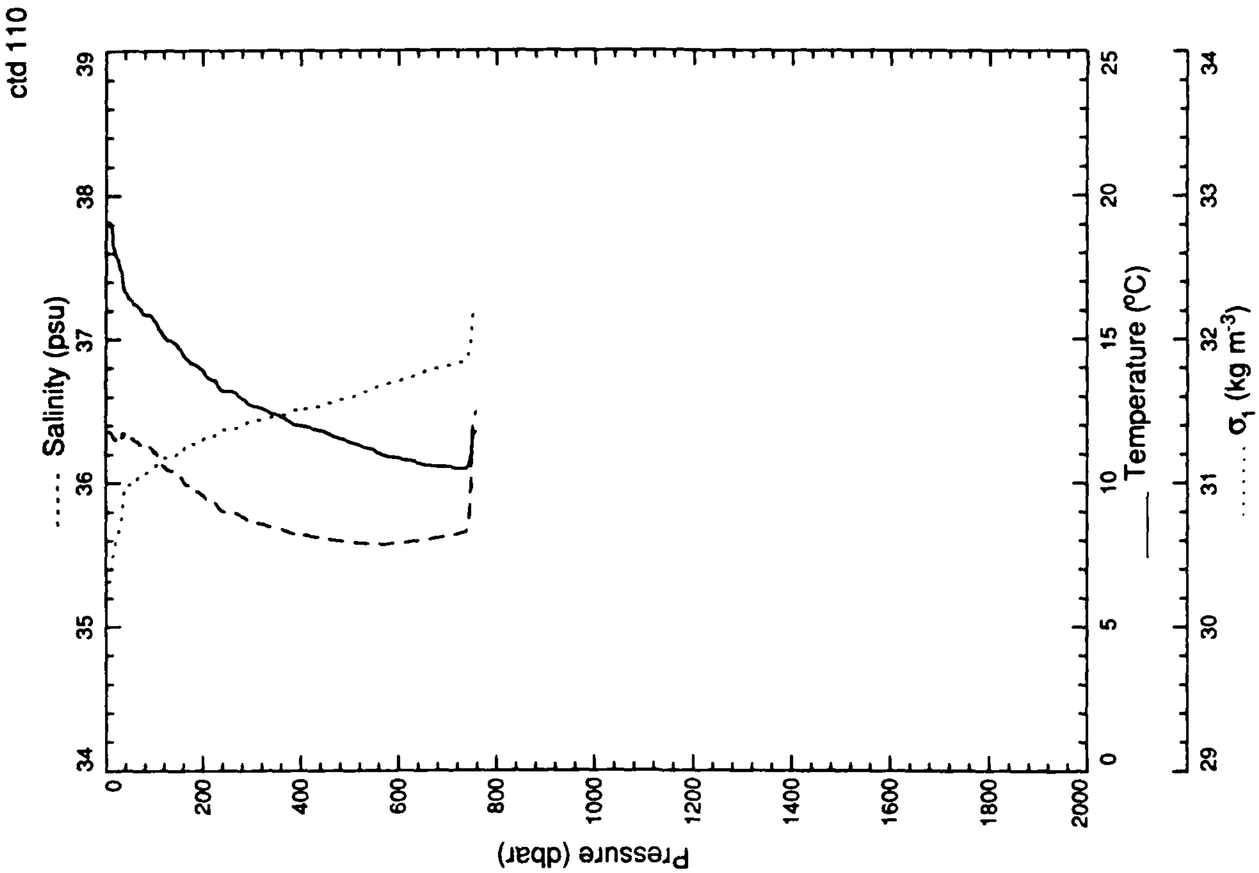

ctd 106
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)
34 35 36 37 38 39
0 5 10 15 20 25
29 30 31 32 33 34
0 200 400 600 800 1000 1200 1400 1600 1800 2000

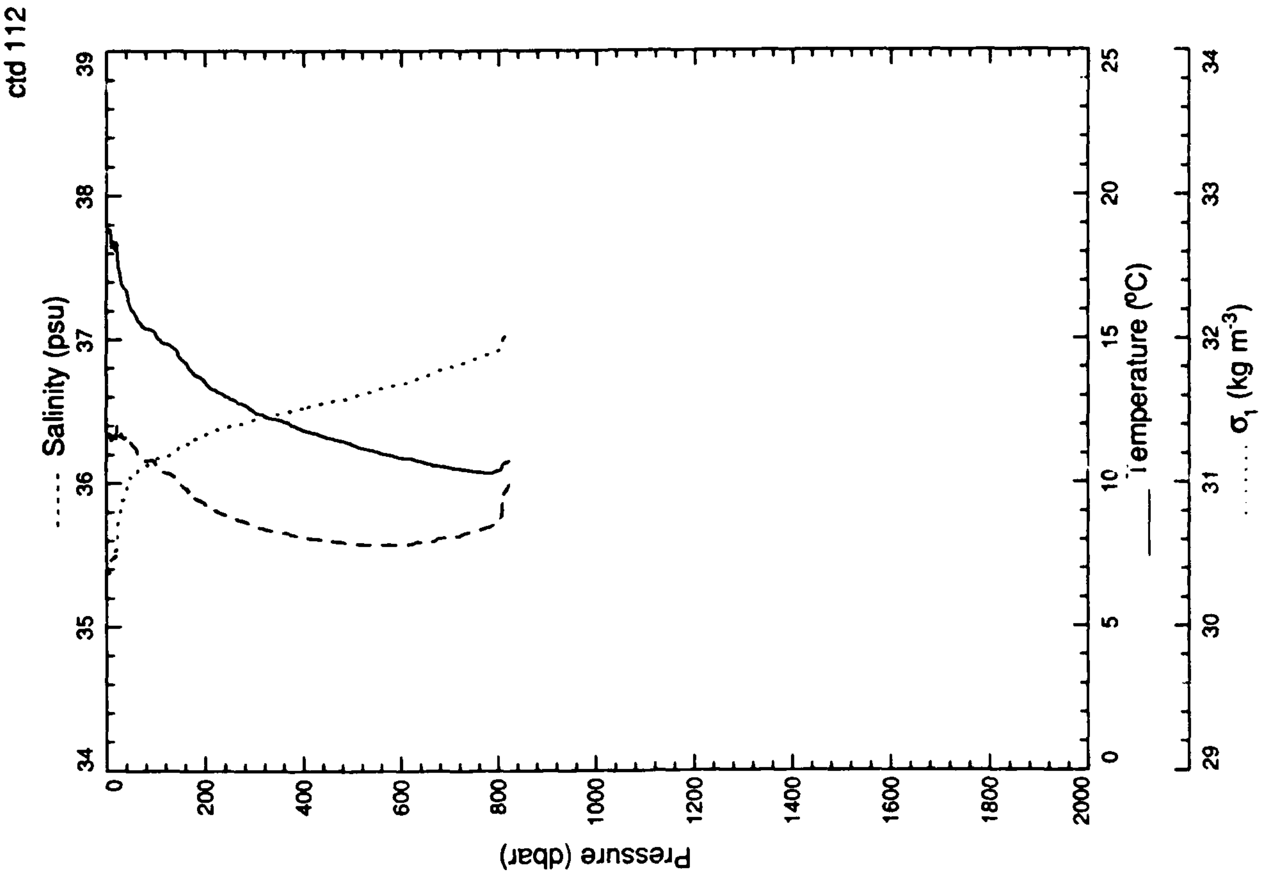

ctd 105
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)
34 35 36 37 38 39
0 5 10 15 20 25
29 30 31 32 33 34
0 200 400 600 800 1000 1200 1400 1600 1800 2000

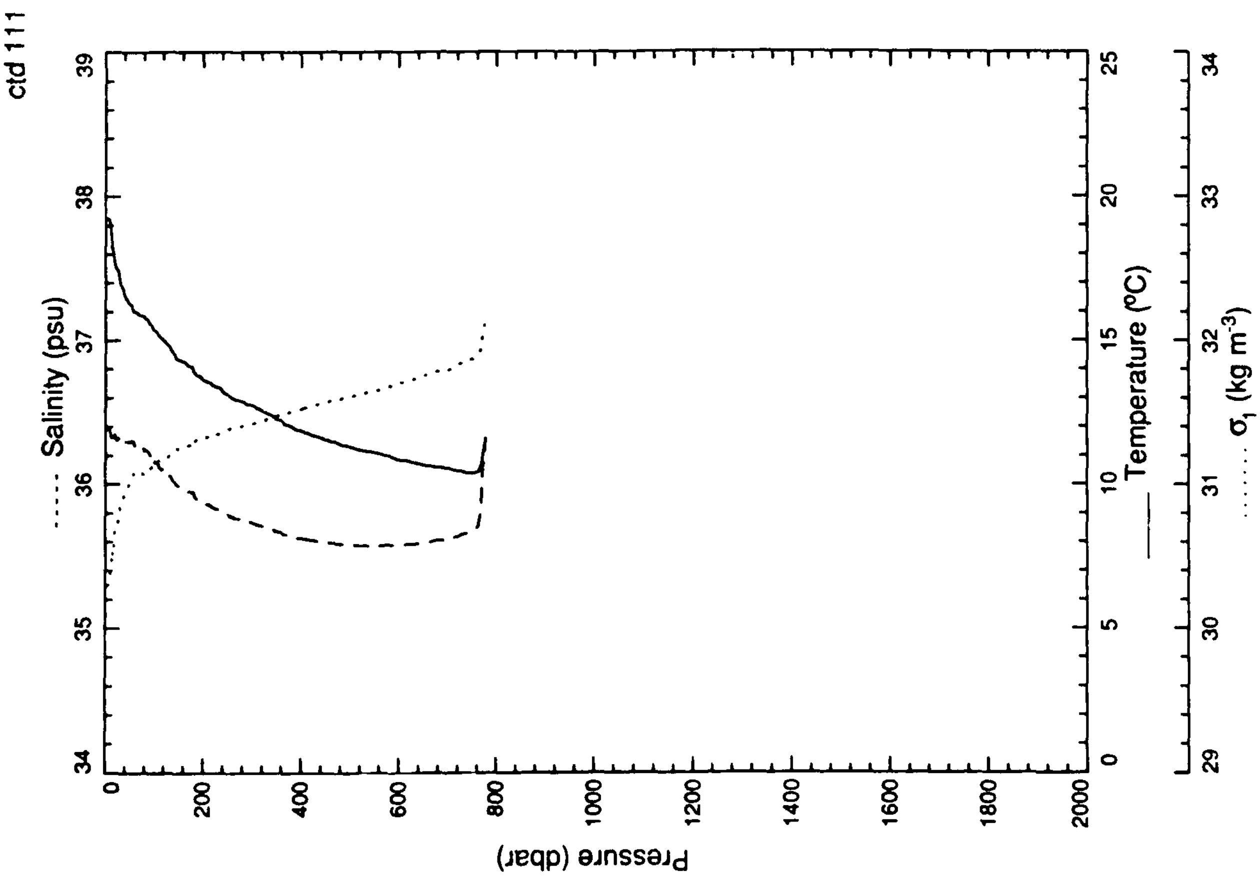

ctd 108
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

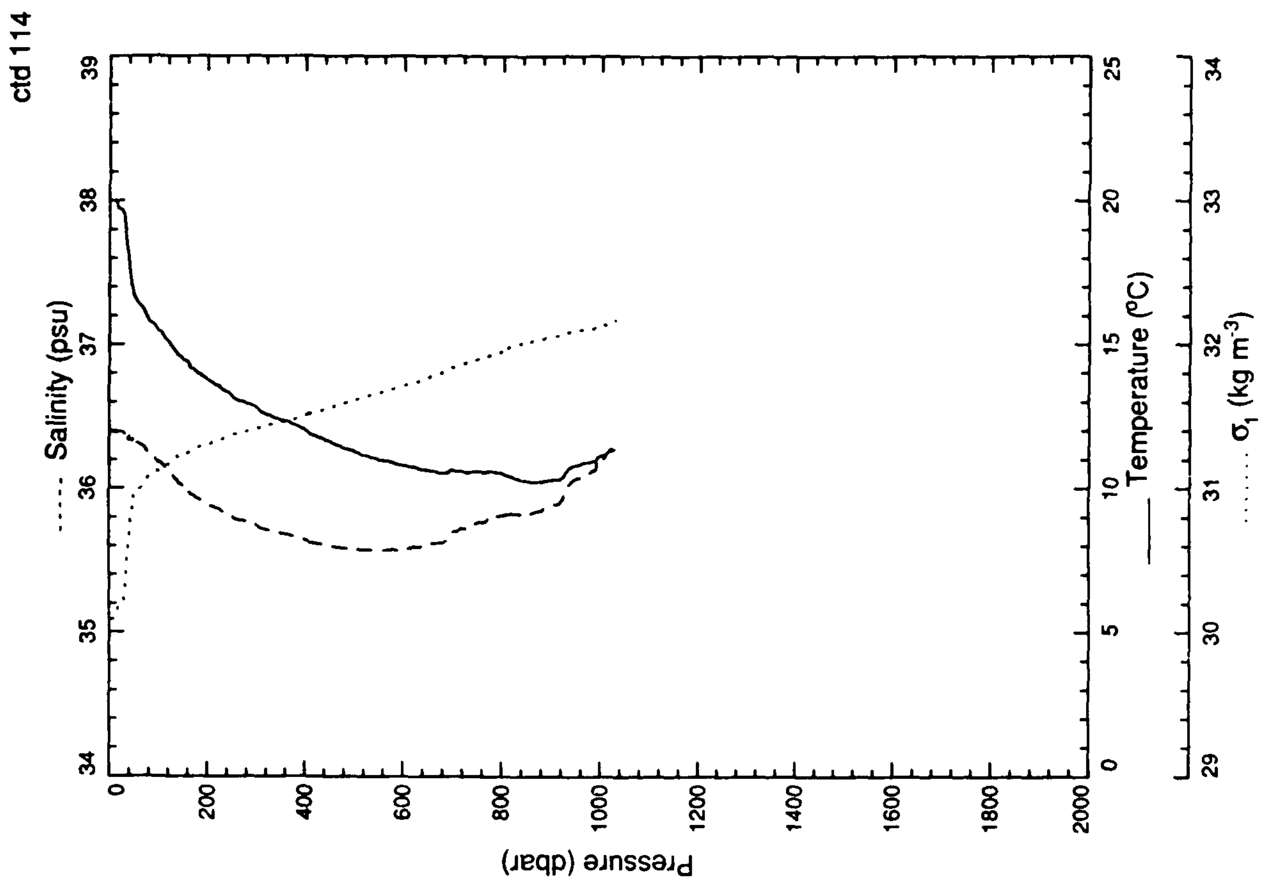

ctd 107
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

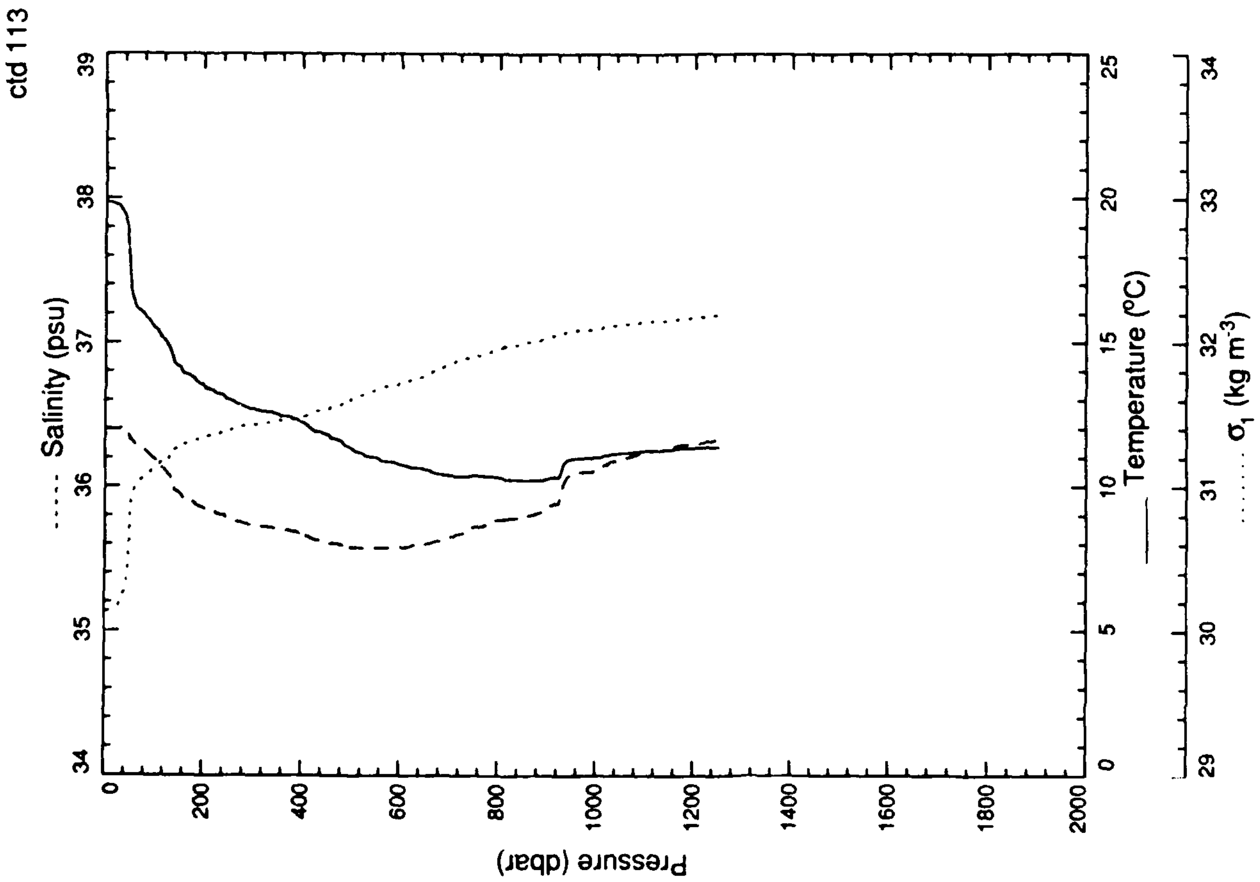

ctd 109
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (°C)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34

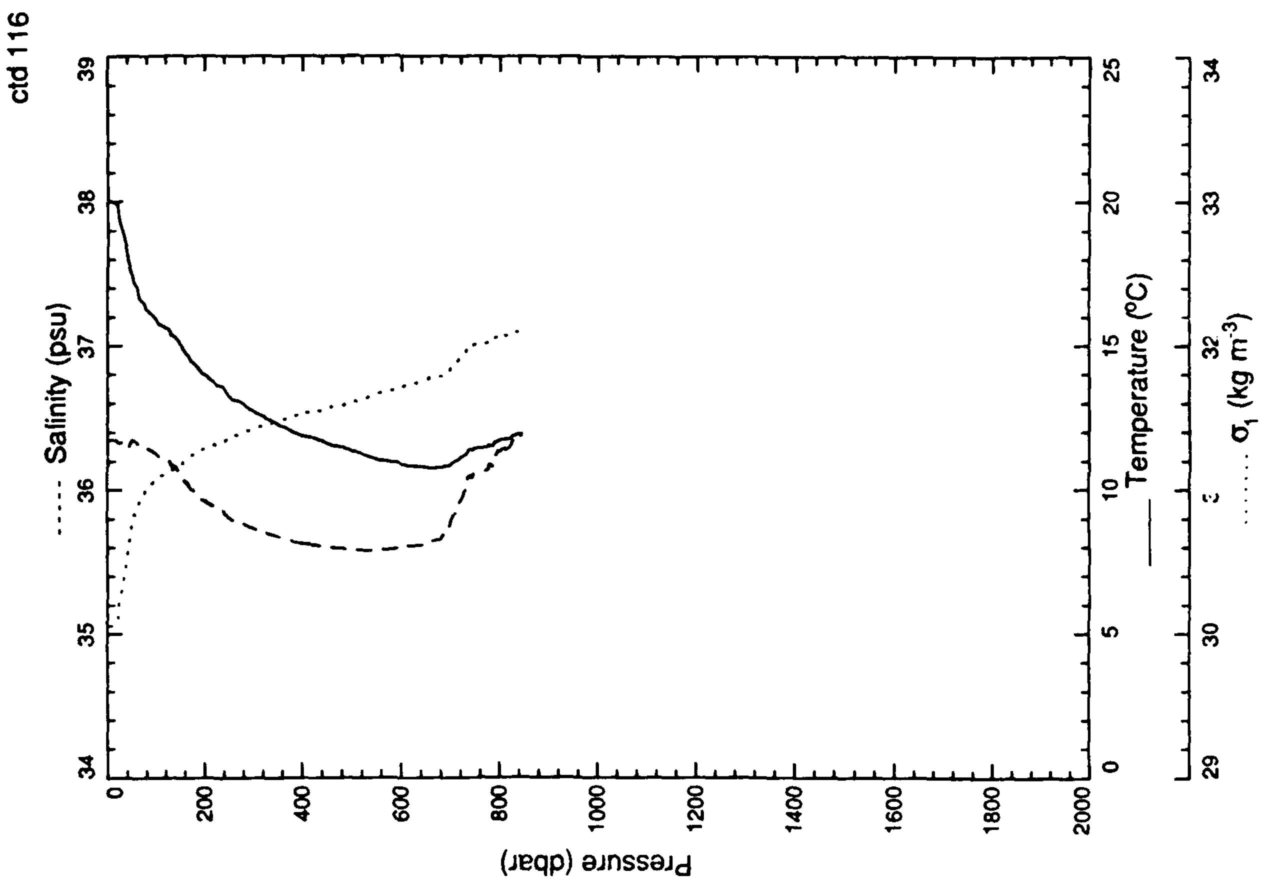

ctd 110
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Temperature (°C)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34

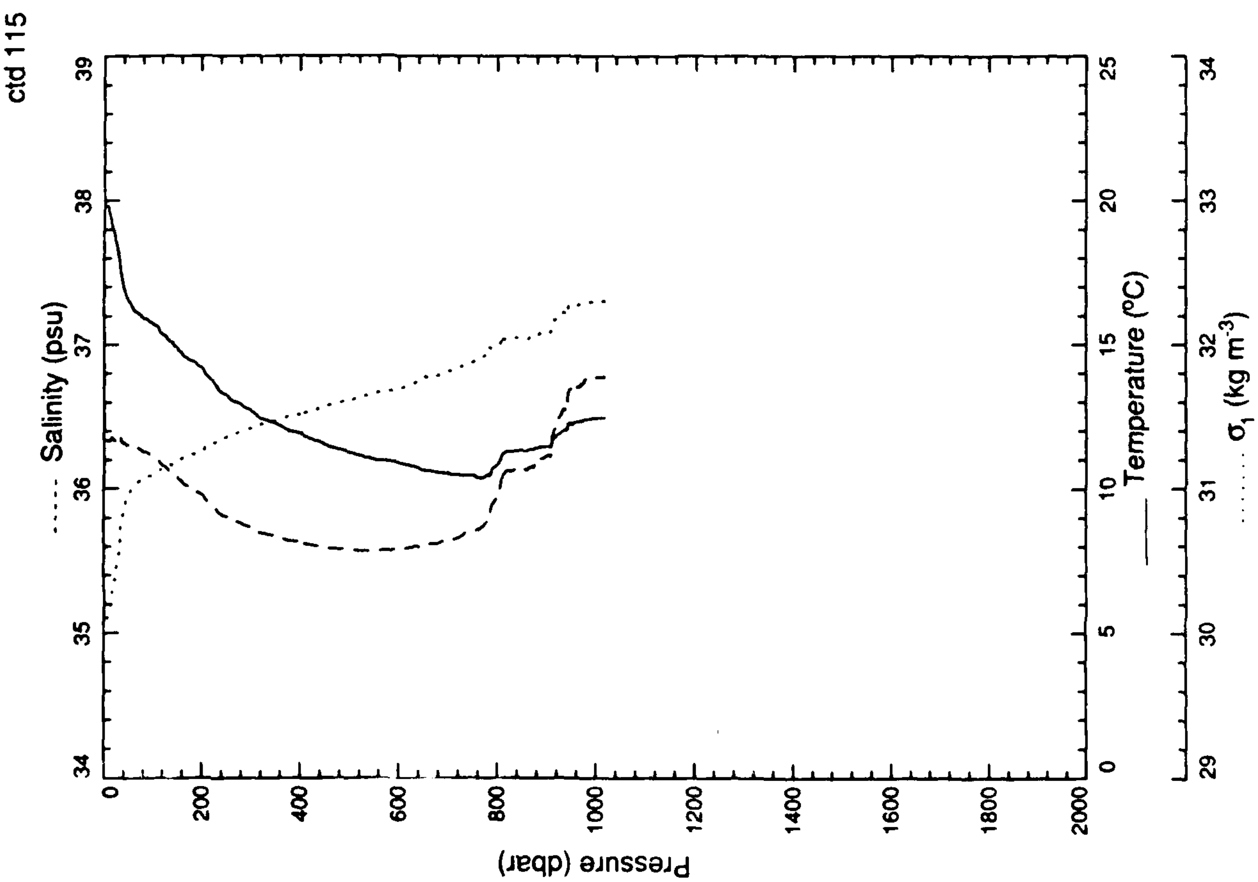

ctd 112
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

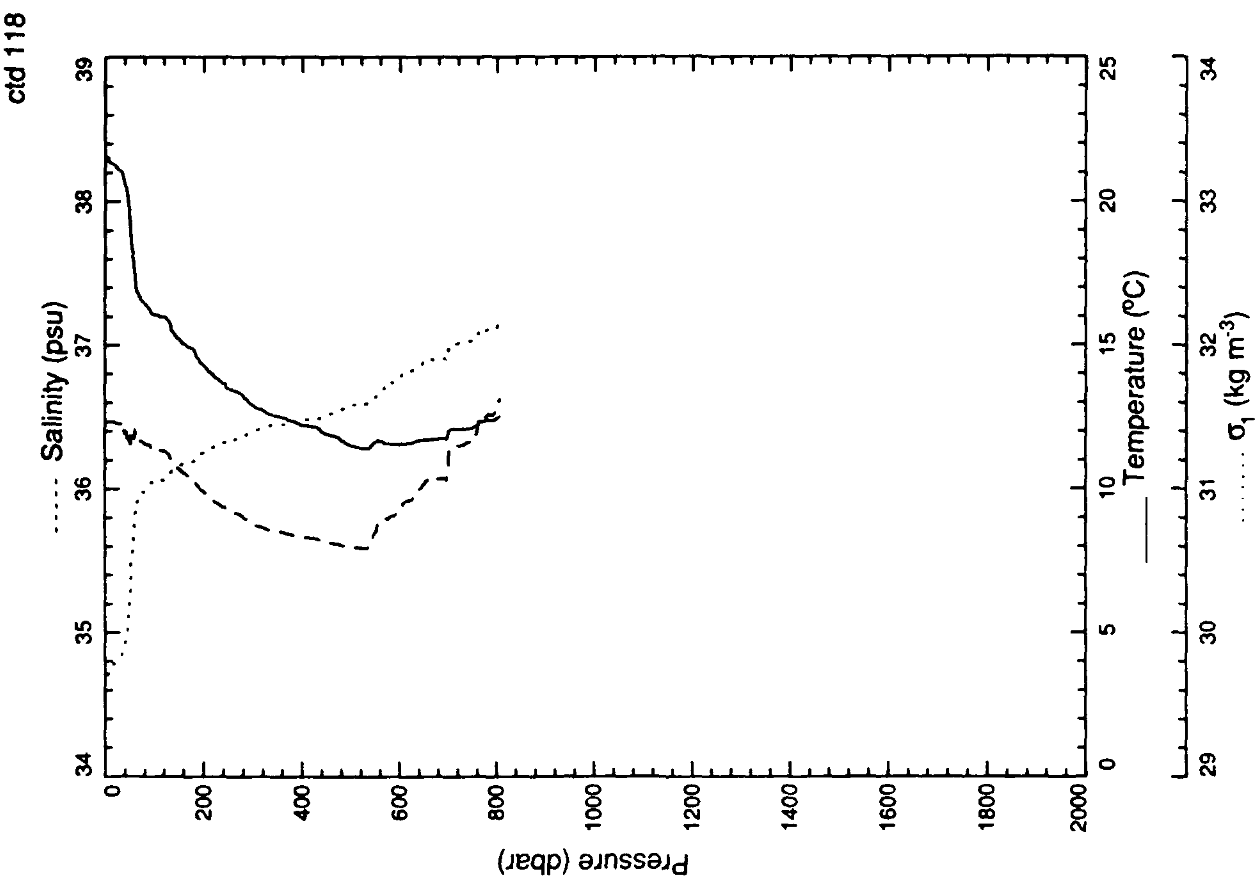

ctd 111
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

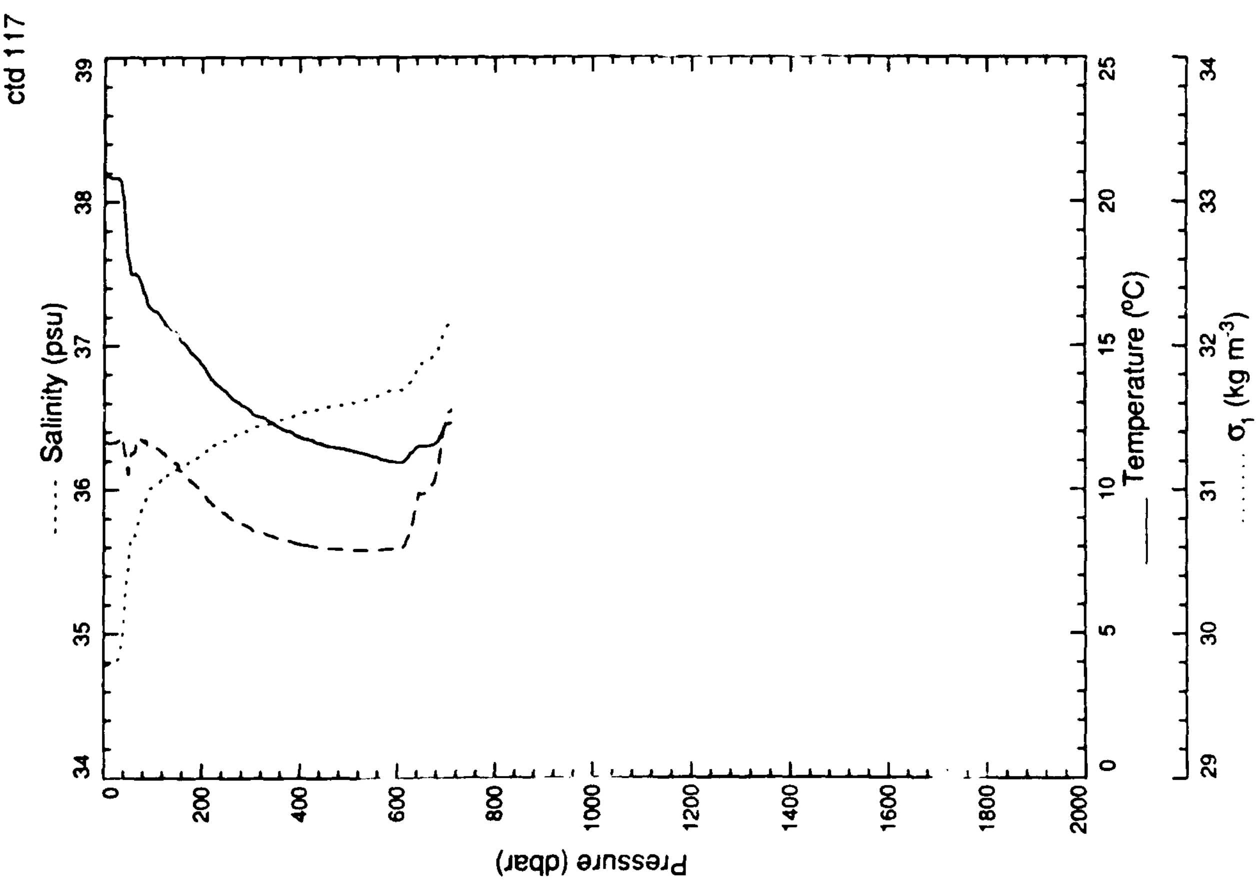

ctd 114
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)

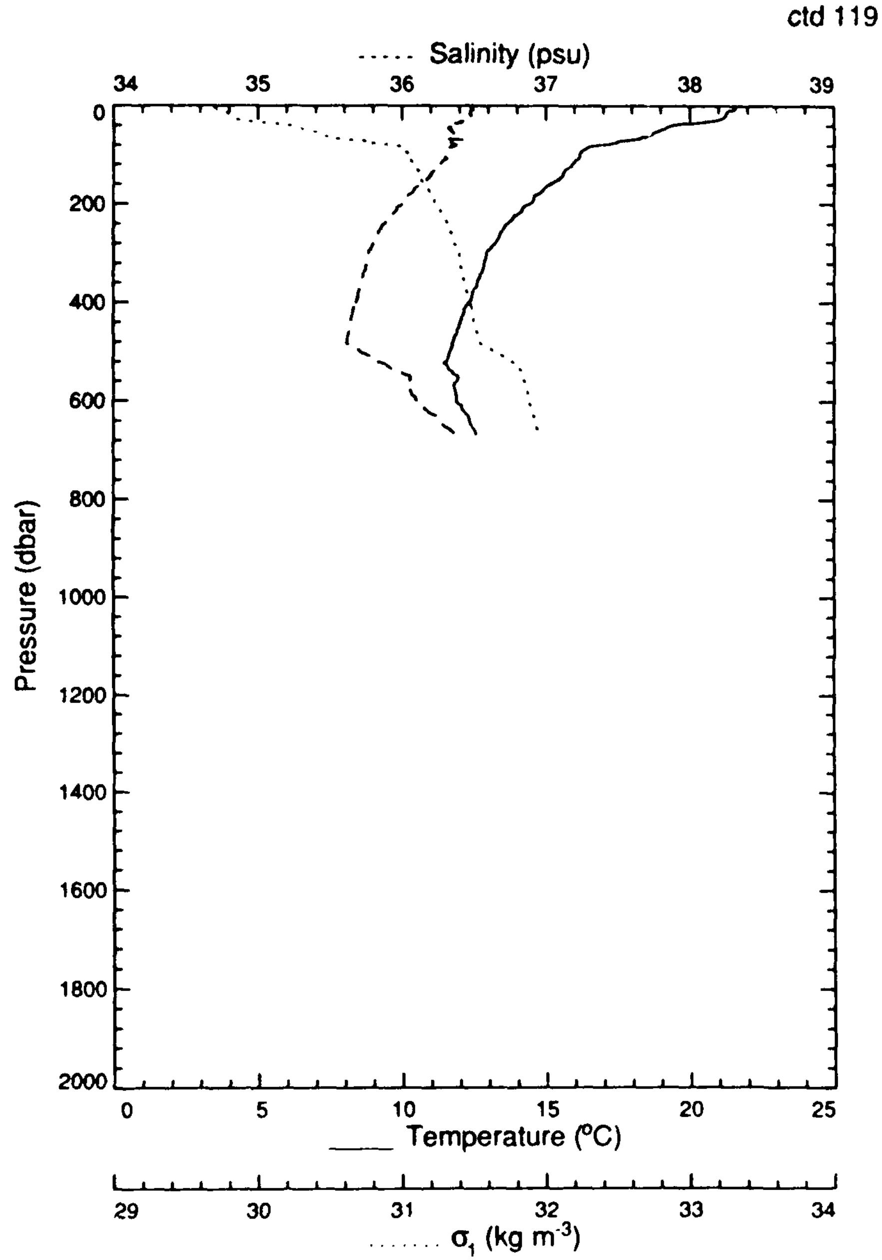

ctd 113
Salinity (psu)
Temperature (°C)
σ1 (kg m-3)
Pressure (dbar)


ctd 116
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

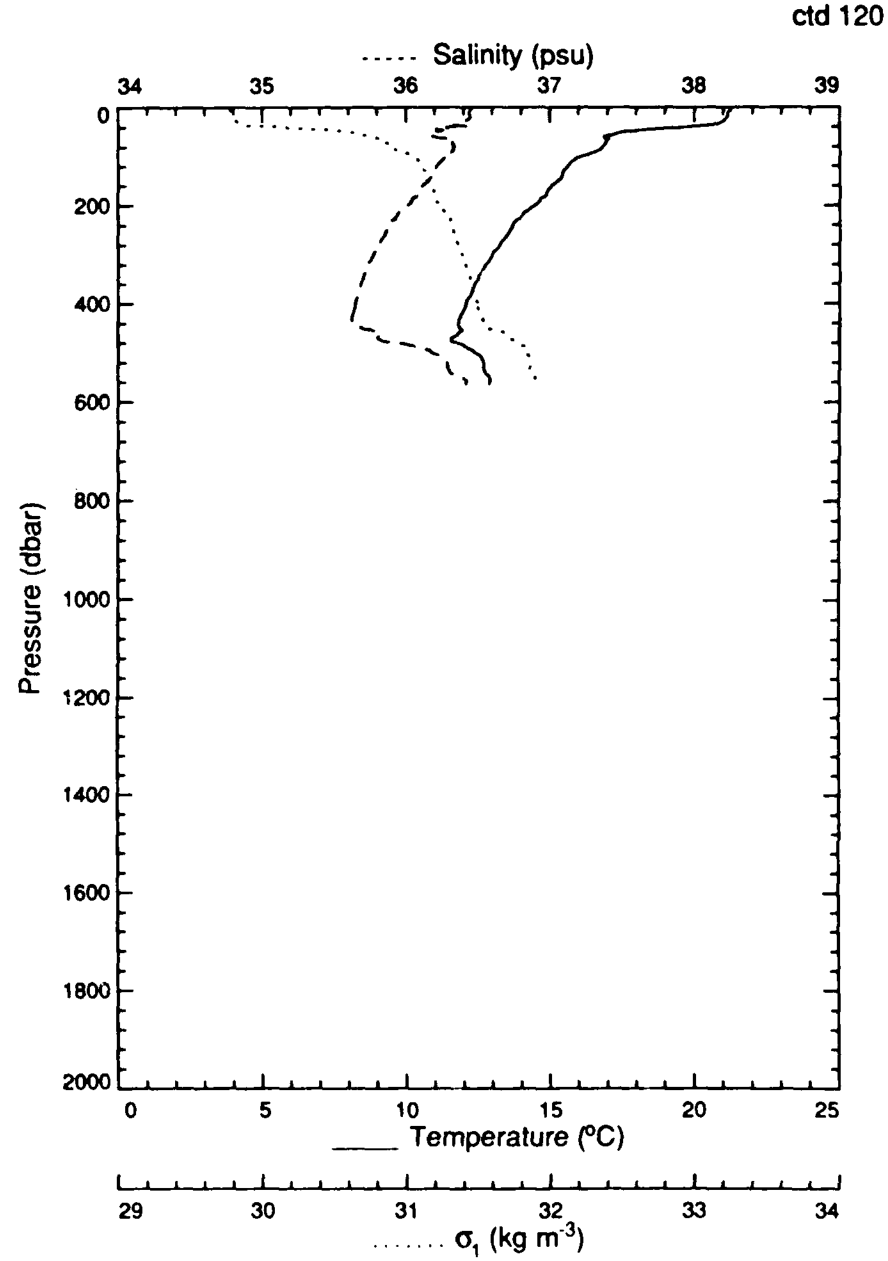

ctd 115
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)


ctd 118
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

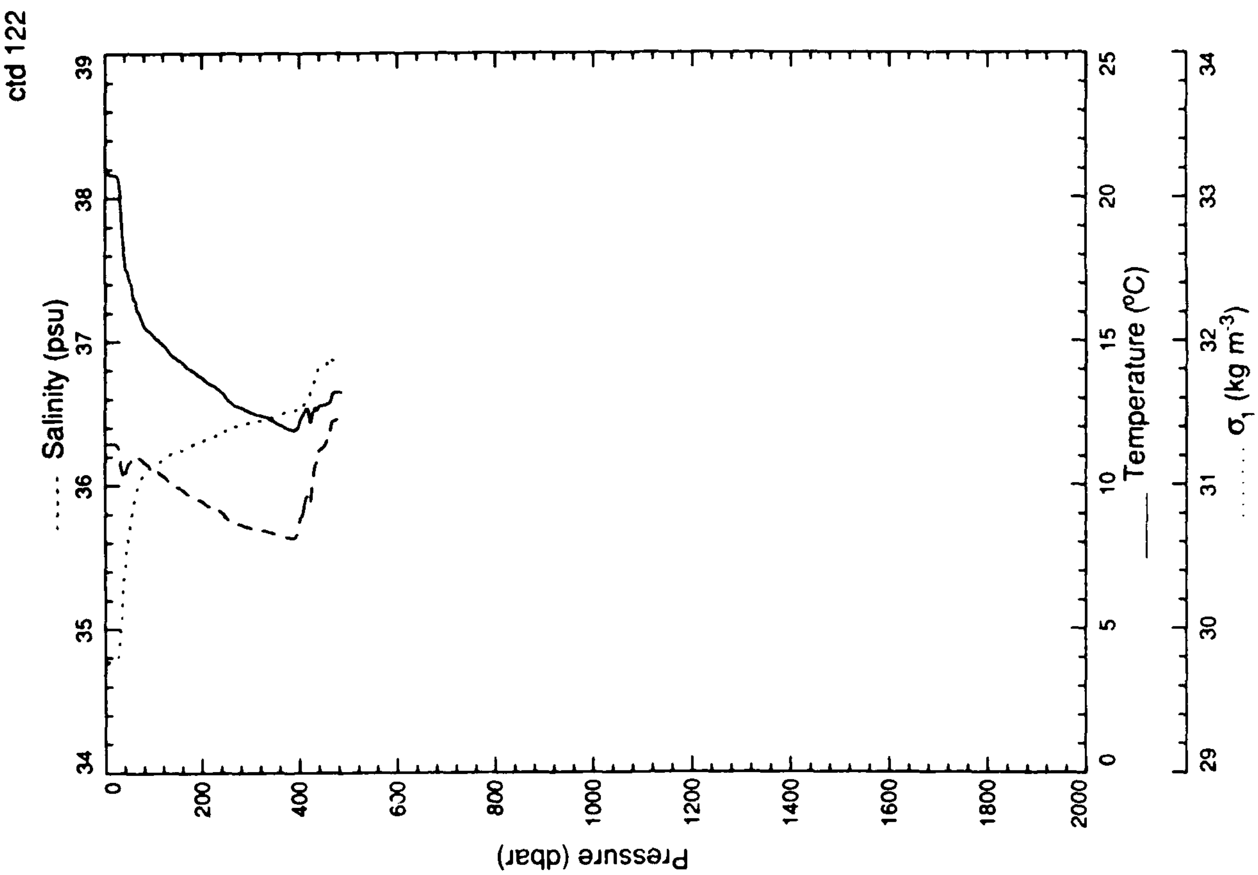

ctd 117
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

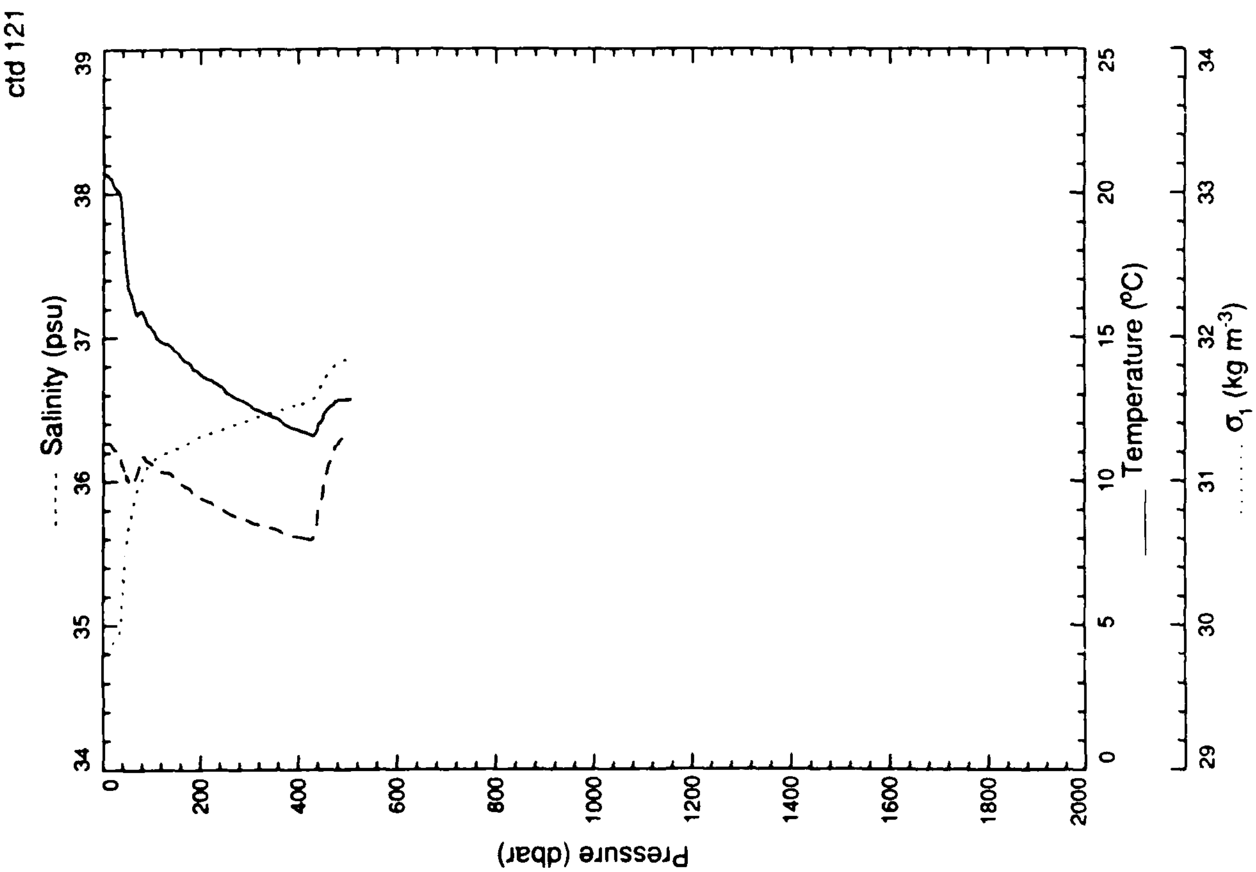


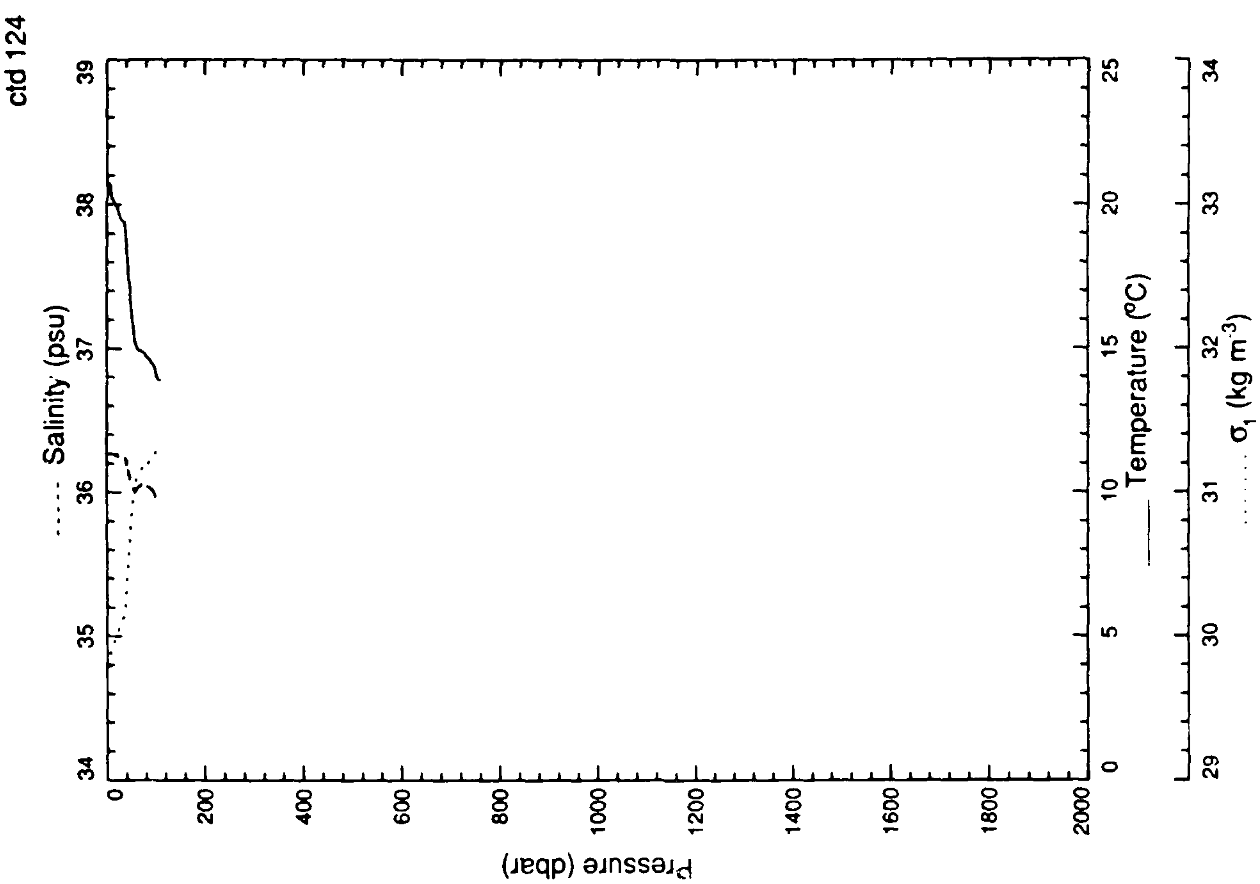
ctd 119
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

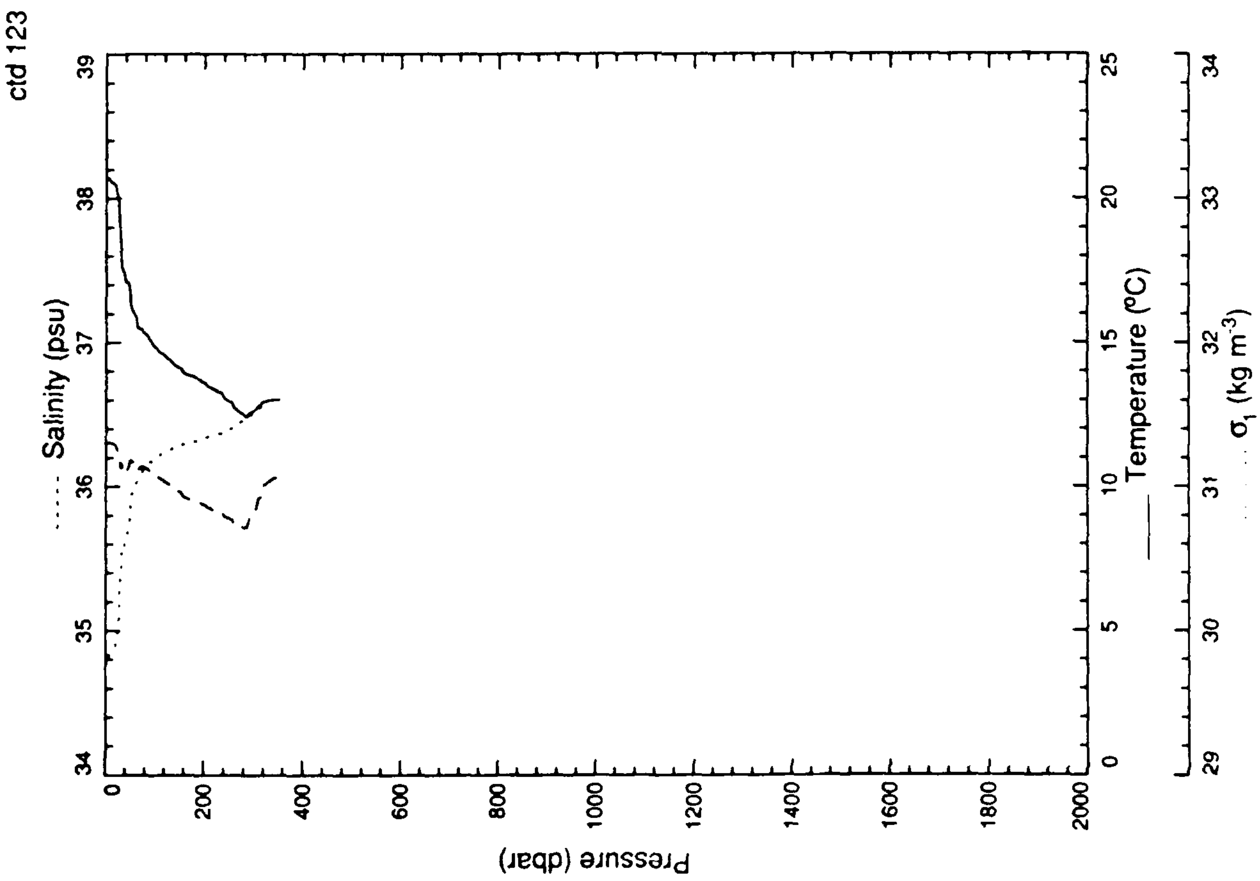


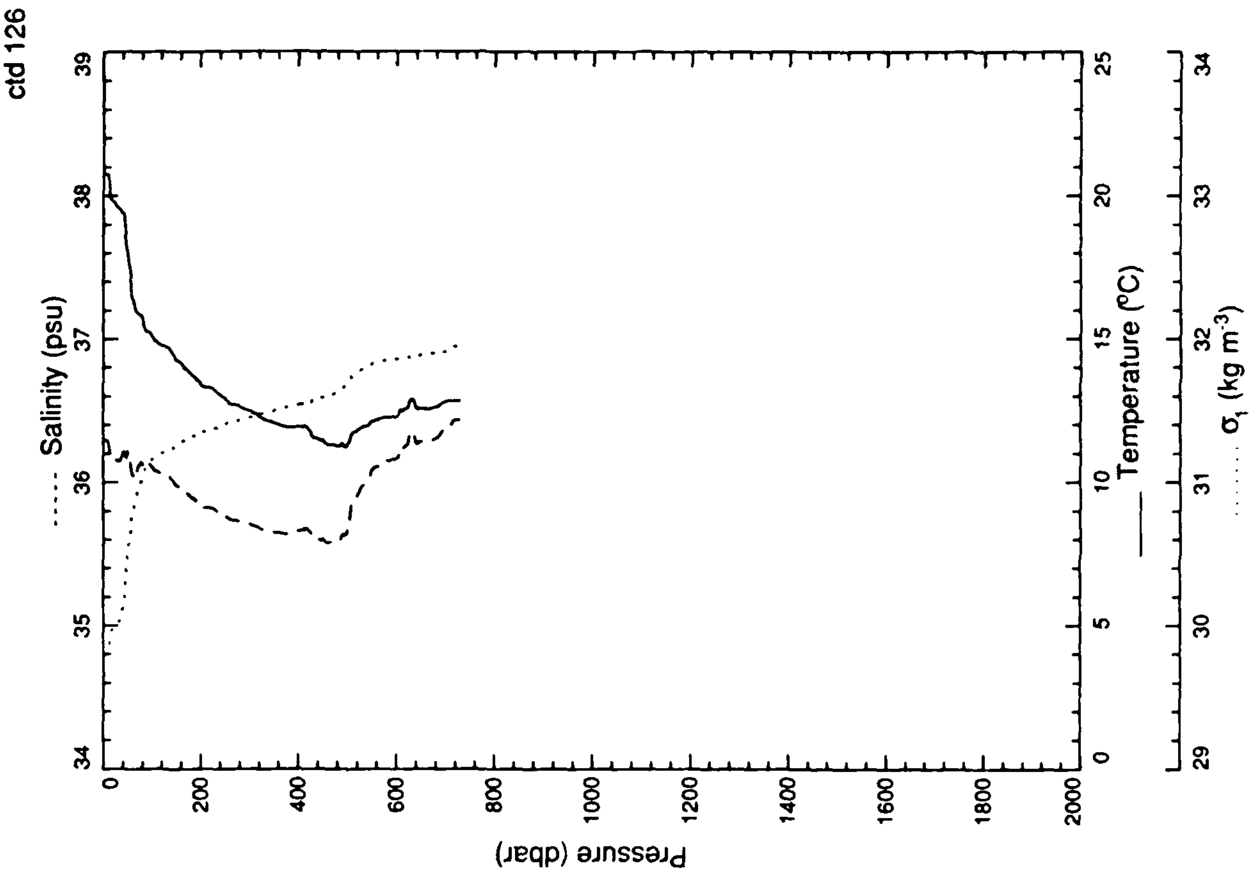
ctd 120
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

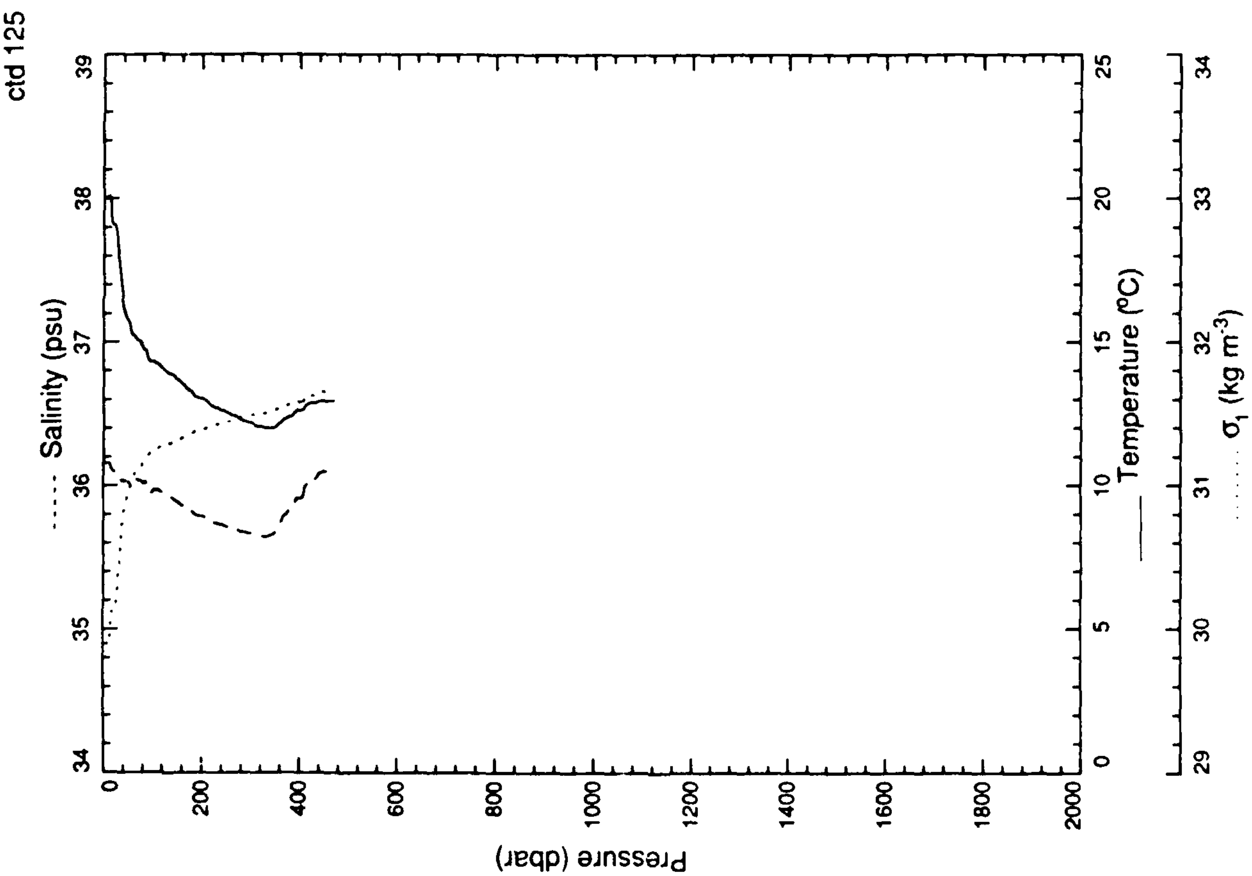

ctd 122
Salinity (psu)
34
35
36
37
38
39
Temperature (ºC)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

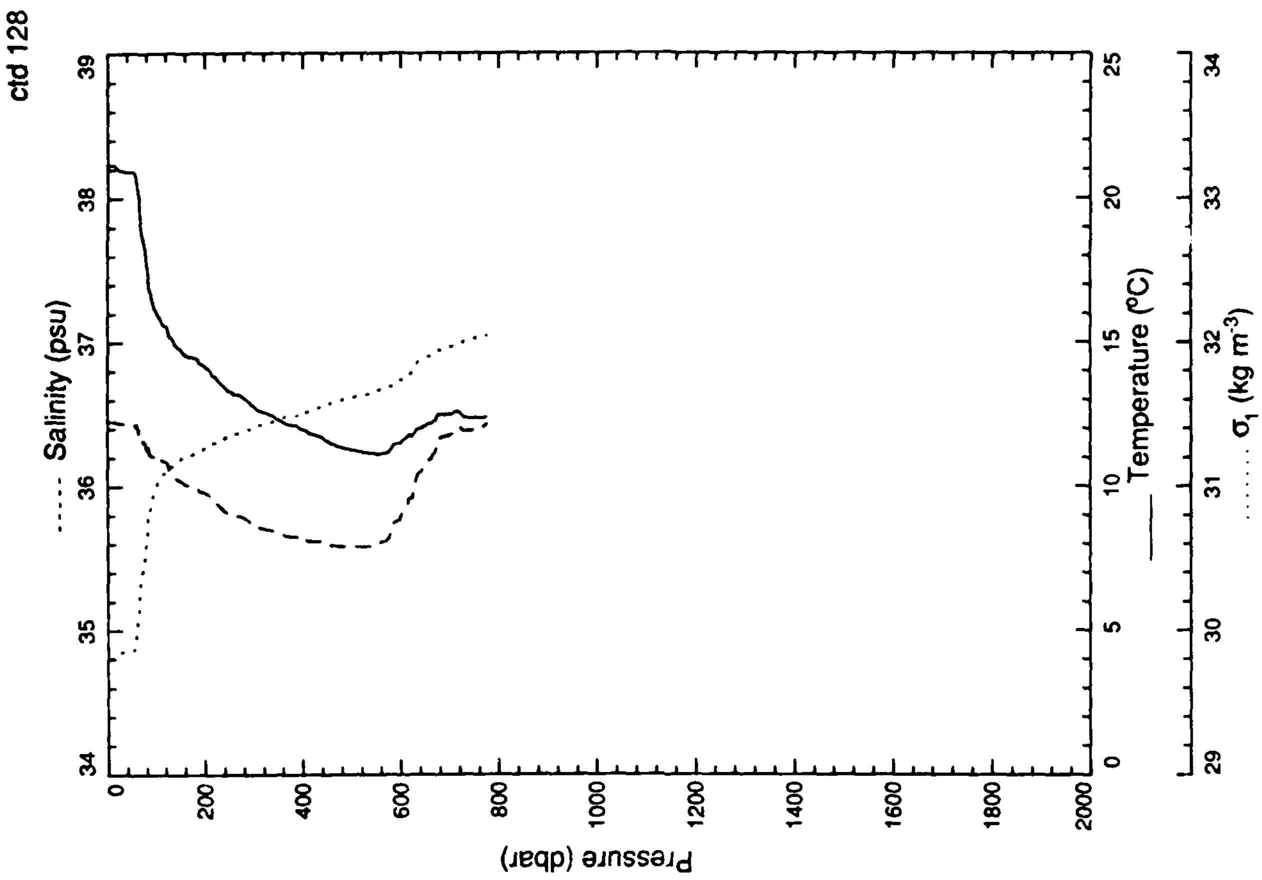

ctd 121
Salinity (psu)
34
35
36
37
38
39
Temperature (ºC)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

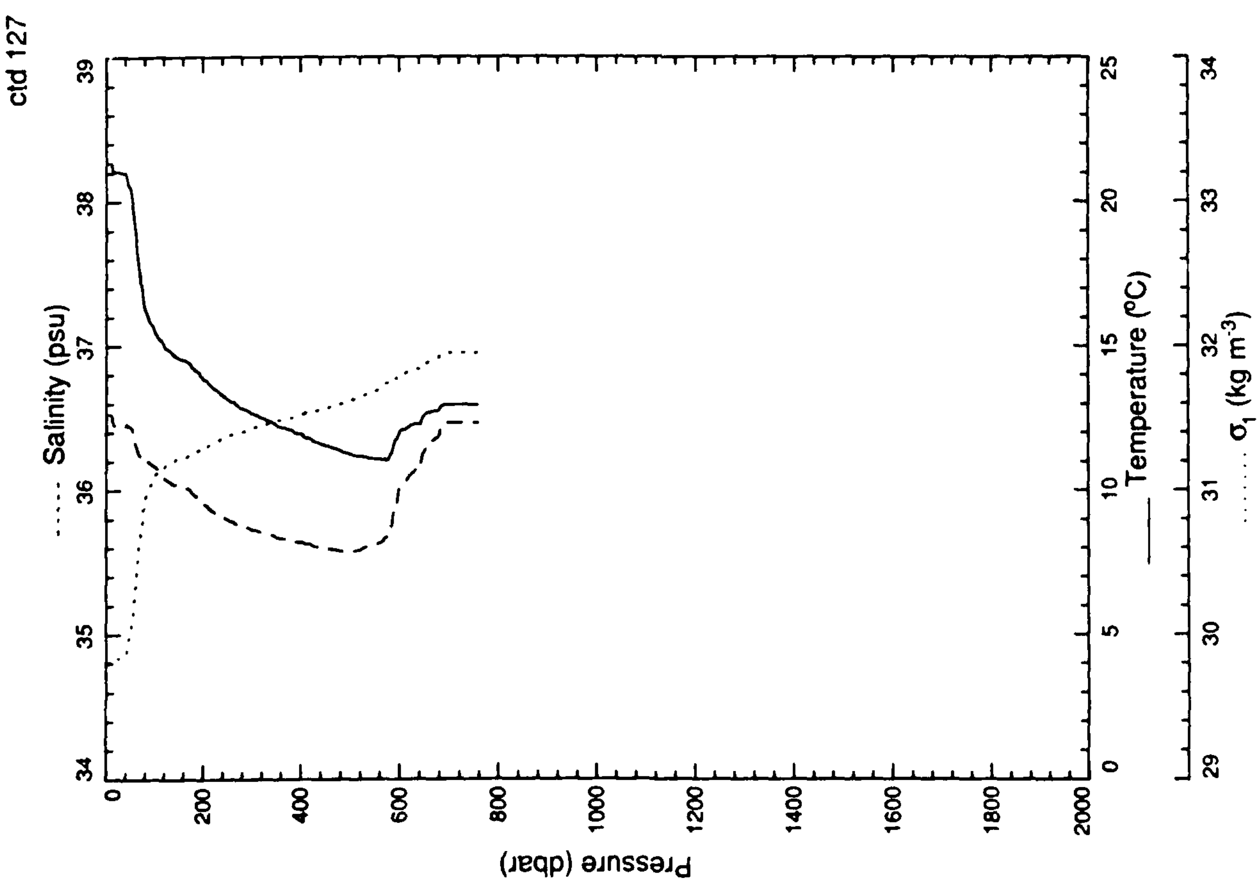

ctd 124
Salinity (psu)
34
35
36
37
38
39
Temperature (ºC)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

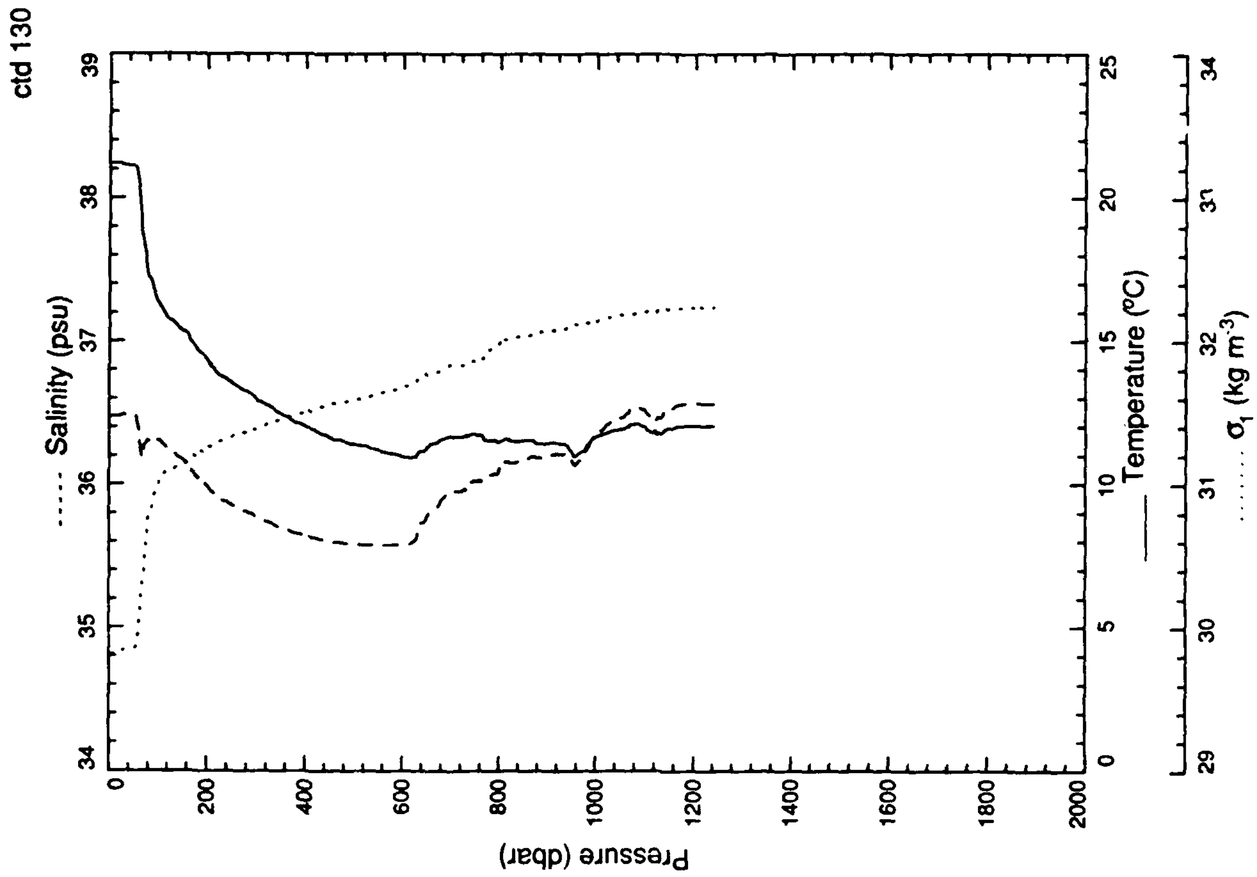

ctd 123
Salinity (psu)
34
35
36
37
38
39
Temperature (ºC)
0
5
10
15
20
25
σ1 (kg m-3)
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

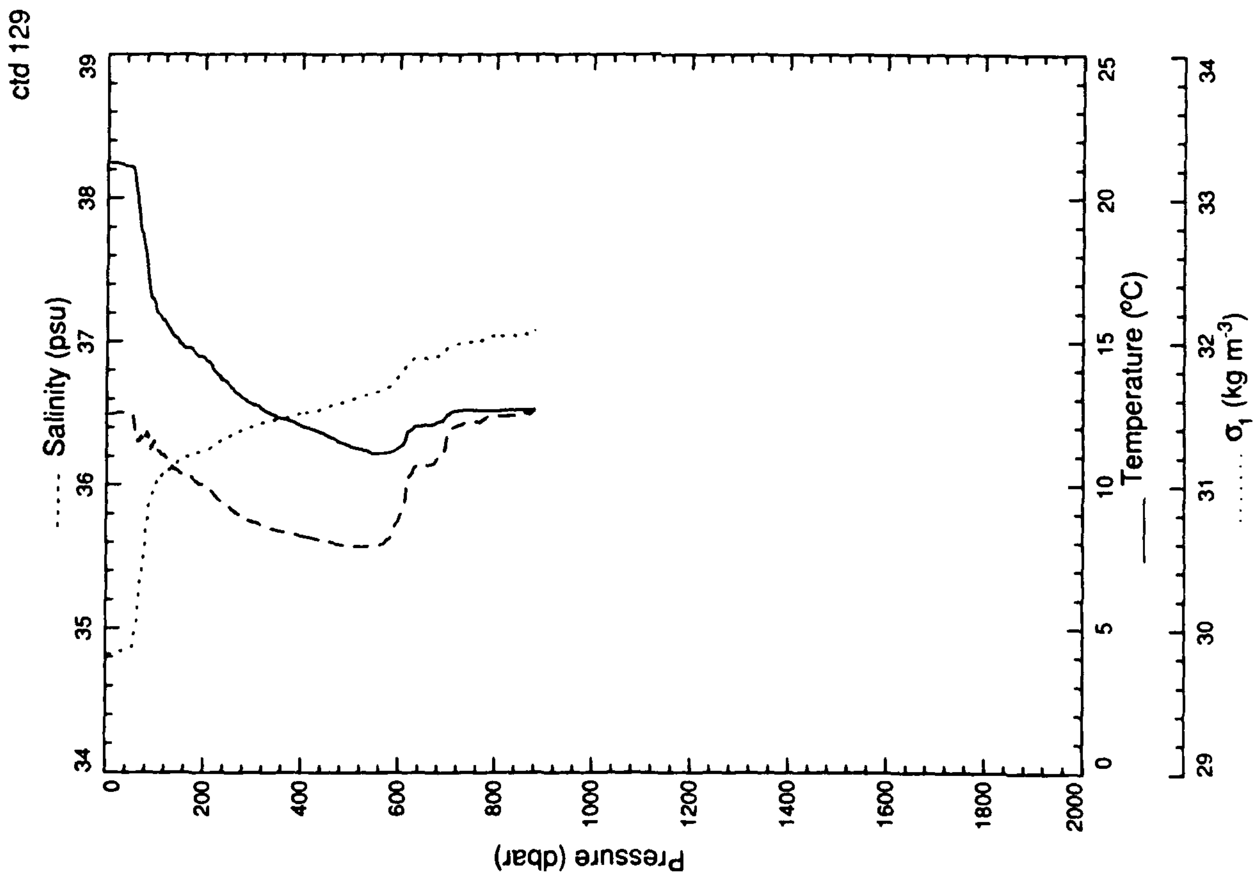

ctd 126
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

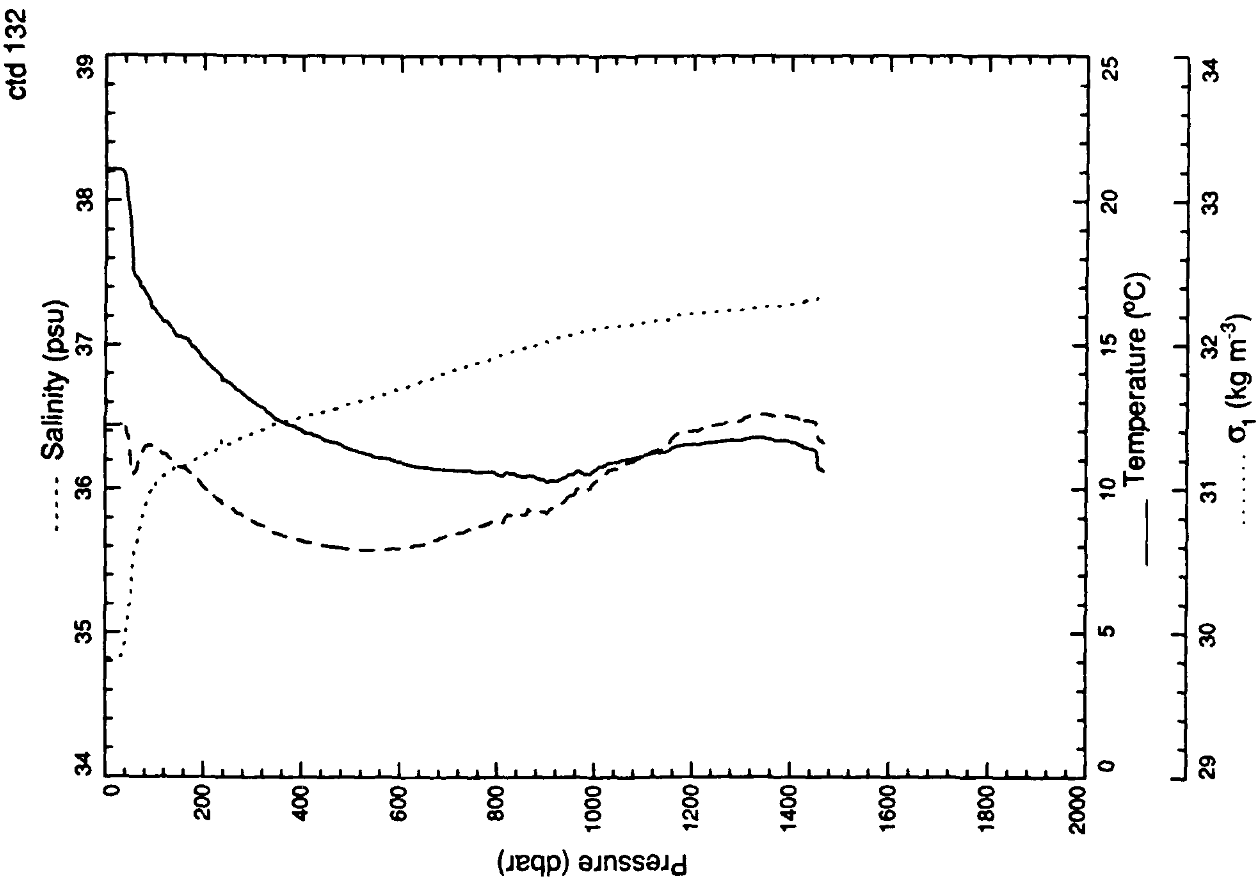

ctd 125
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

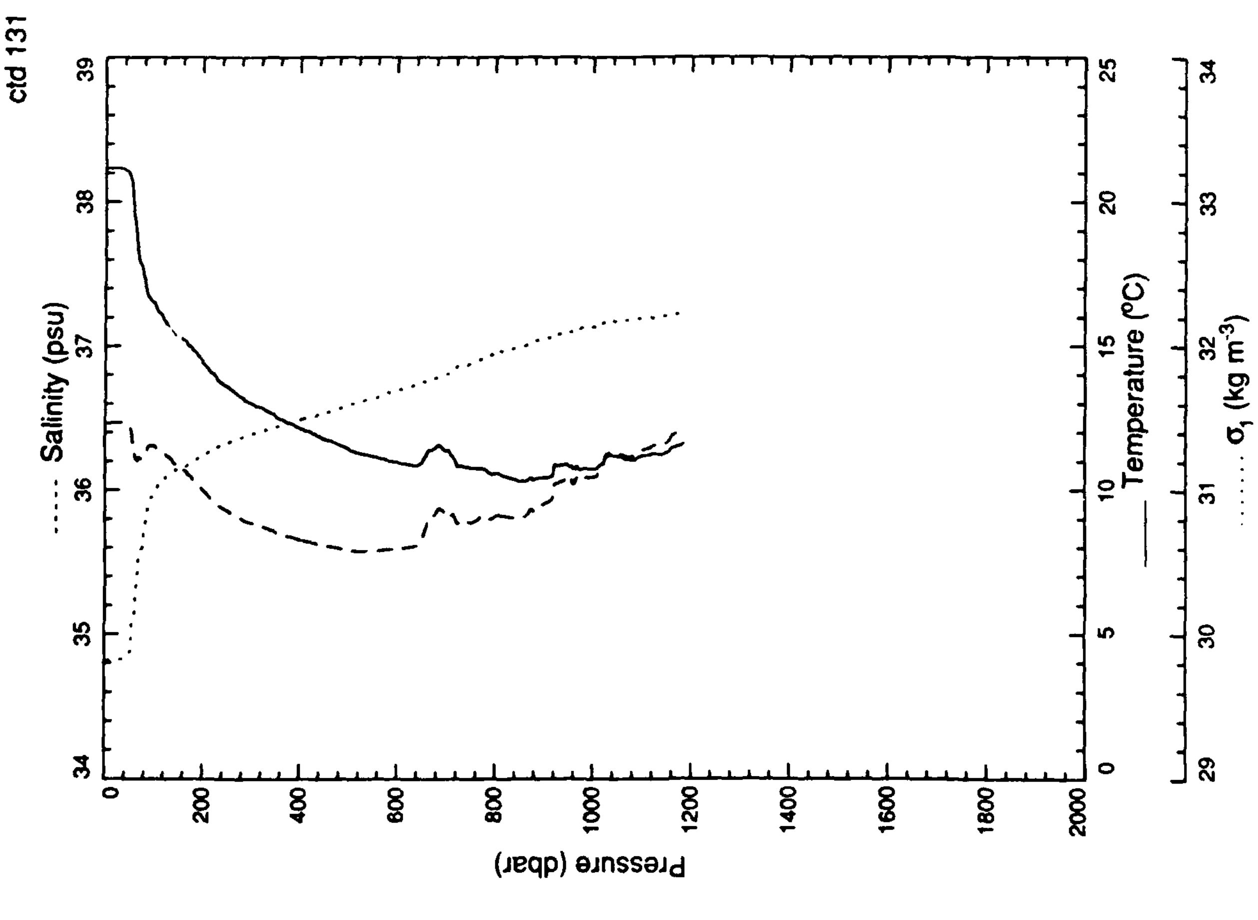

ctd 128
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

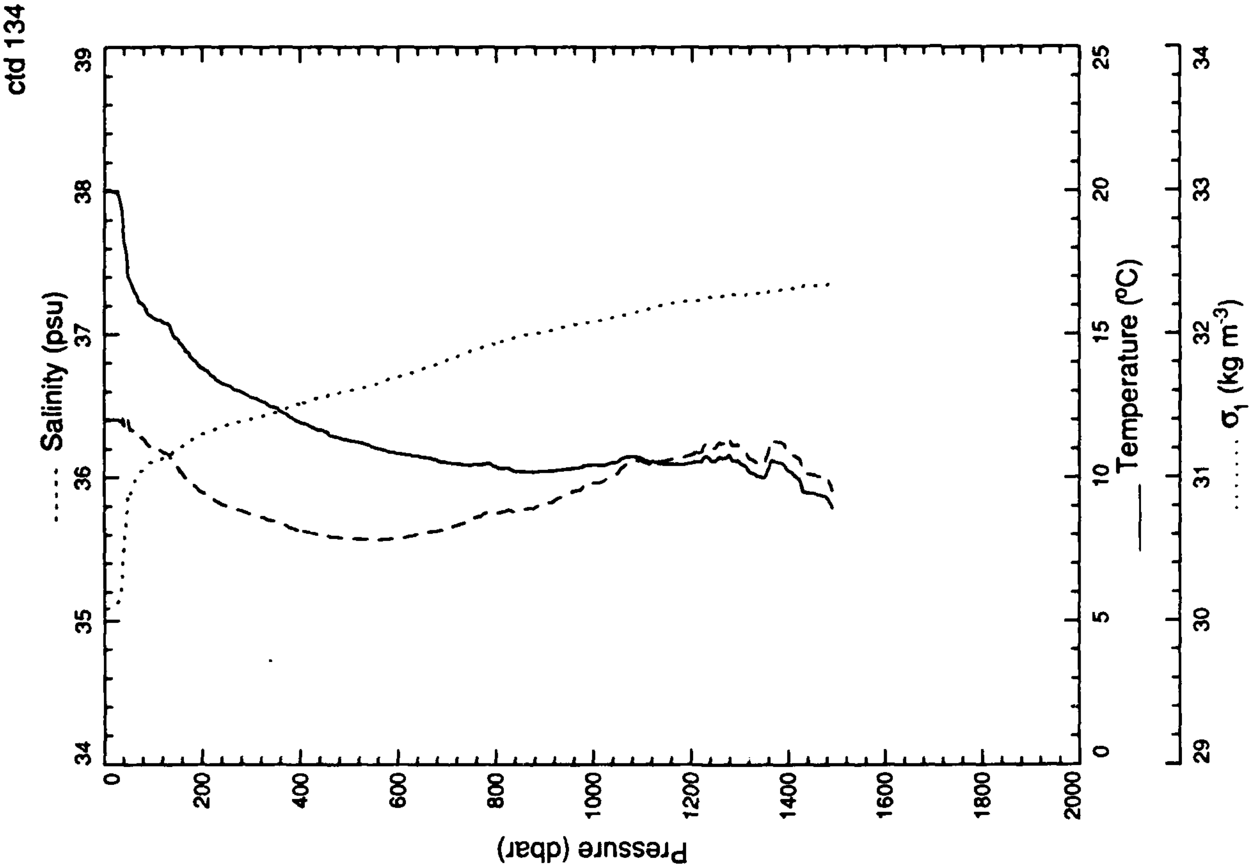

ctd 127
Salinity (psu)
Temperature (ºC)
σ1 (kg m-3)
Pressure (dbar)

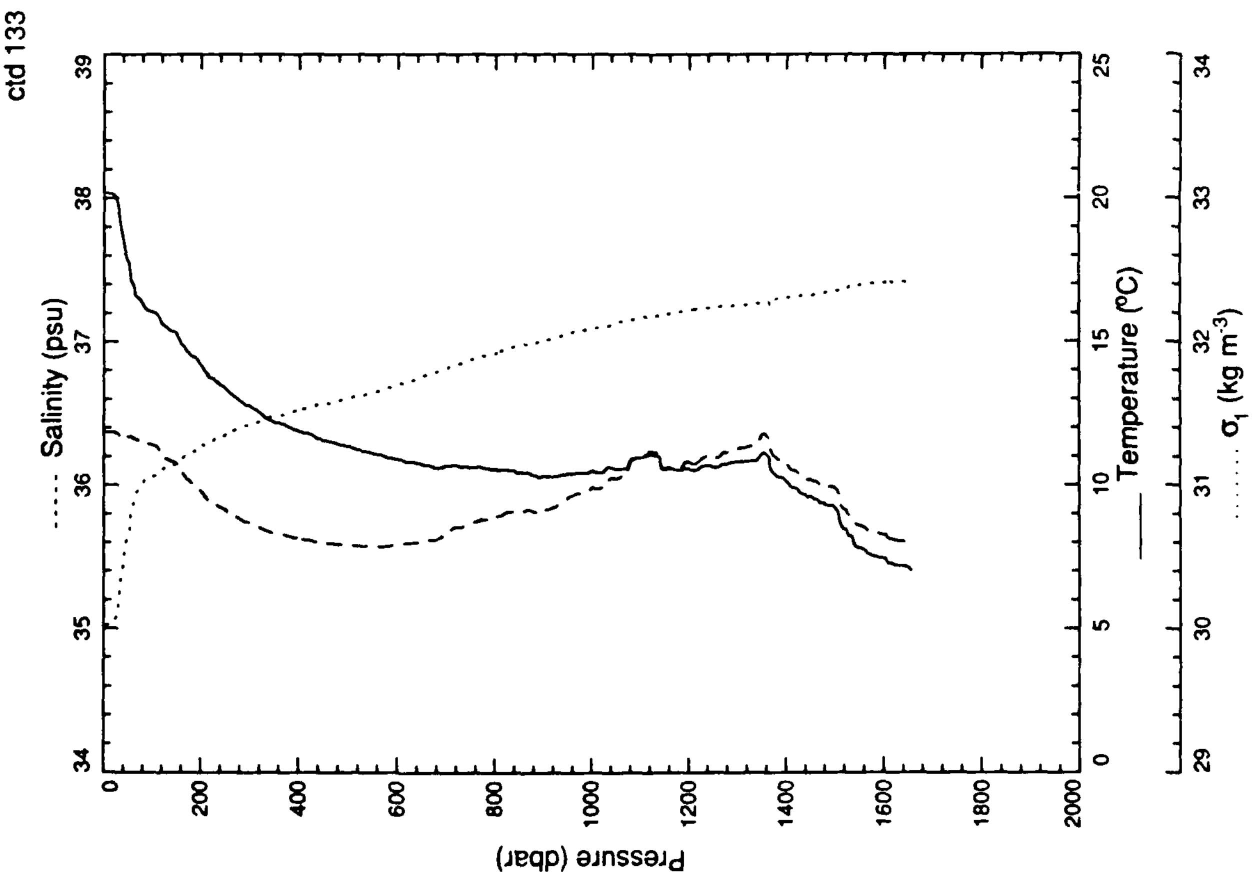

ctd 130
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

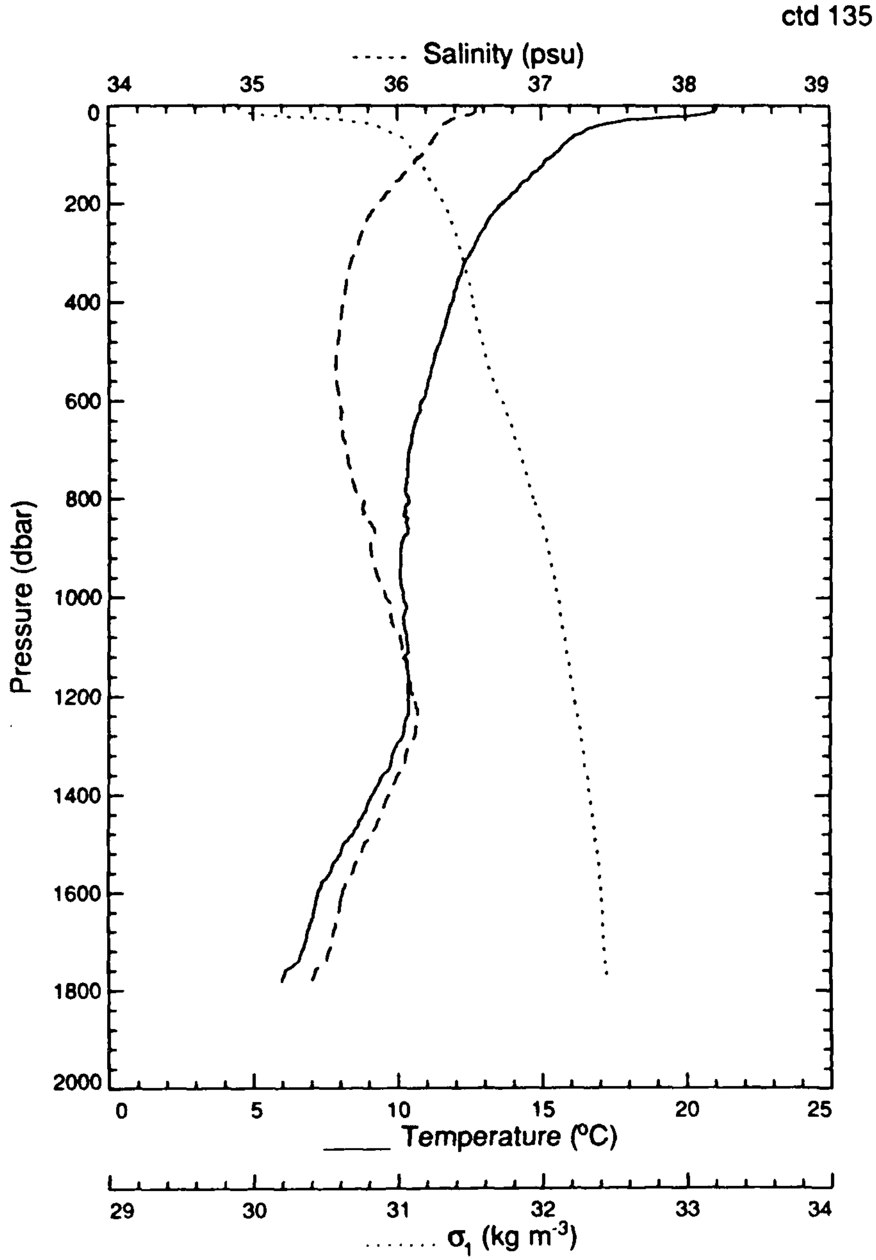

ctd 129
Salinity (psu)
34 35 36 37 38 39
Temperature (°C)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

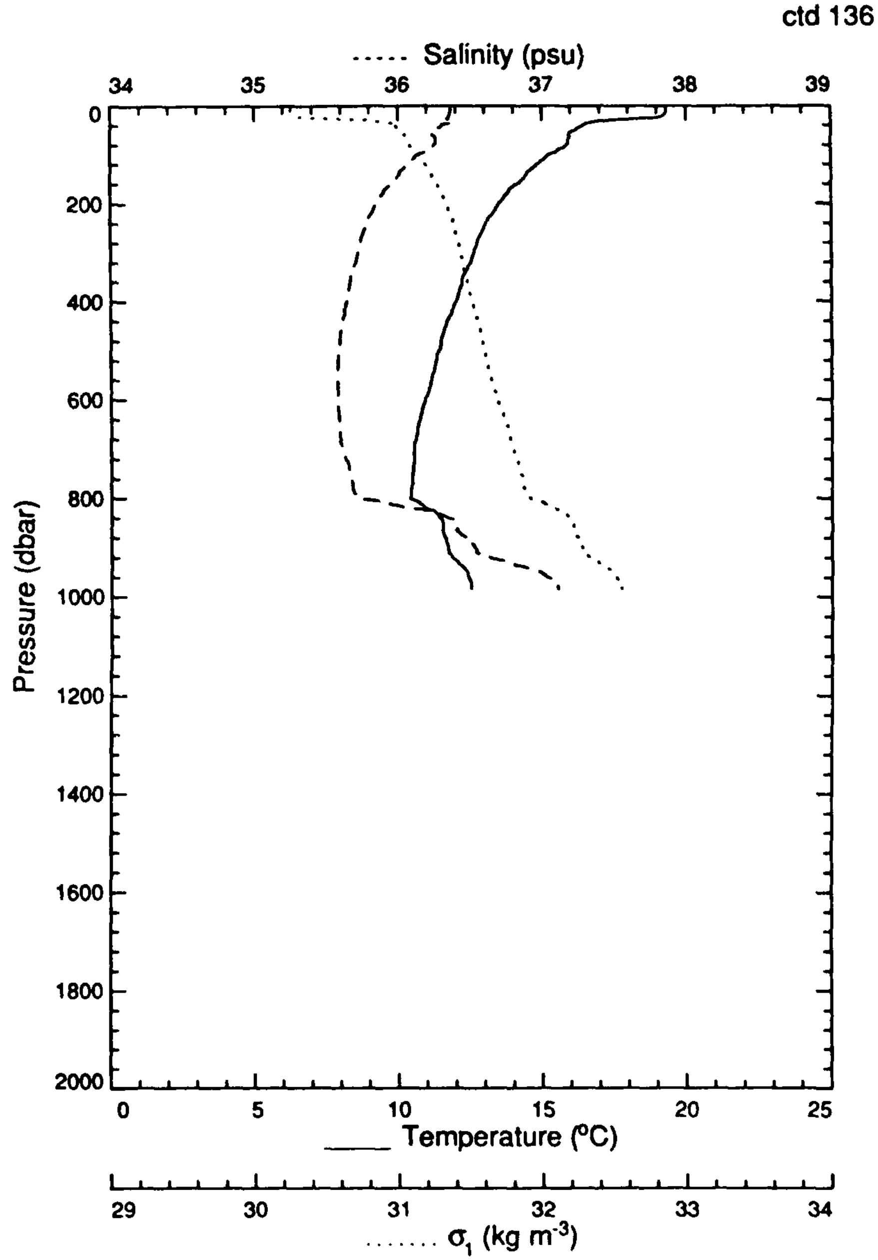

ctd 132
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)
34
35
36
37
38
39
0
5
10
15
20
25
29
30
31
32
33
34
0
200
400
600
800
1000
1200
1400
1600
1800
2000

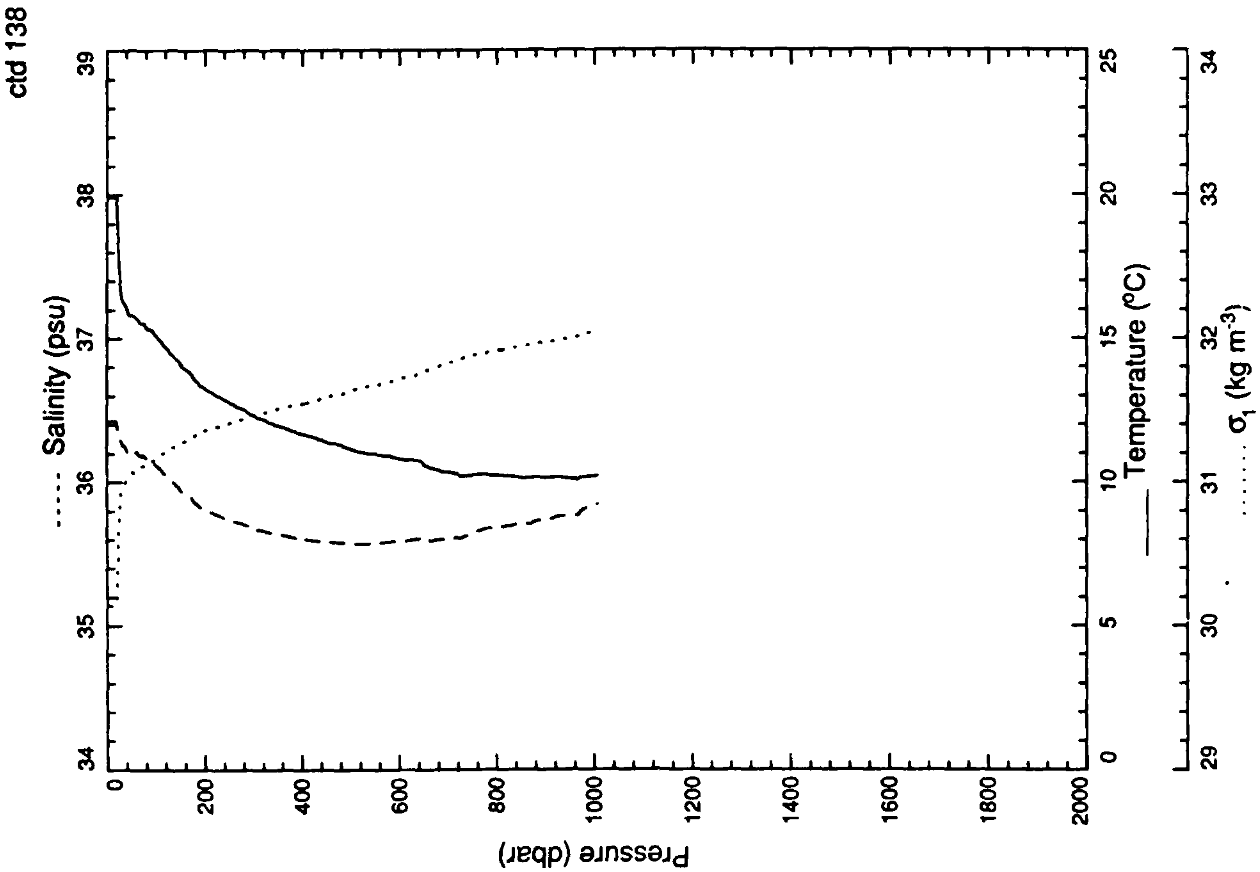

ctd 131
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)
34
35
36
37
38
39
0
5
10
15
20
25
29
30
31
32
33
34
0
200
400
600
800
1000
1200
1400
1600
1800
2000

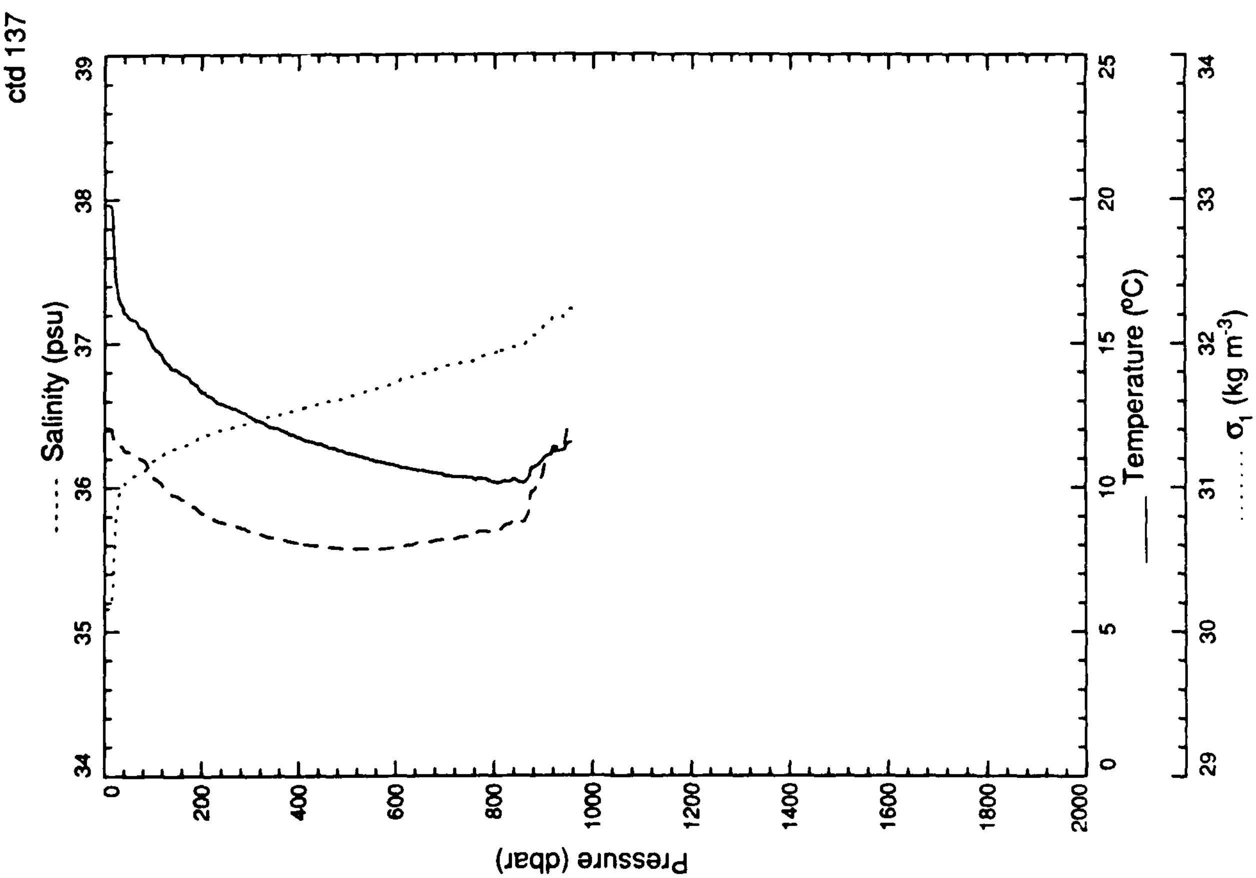

ctd 134
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)
34
35
36
37
38
39
0
5
10
15
20
25
29
30
31
32
33
34
0
200
400
600
800
1000
1200
1400
1600
1800
2000

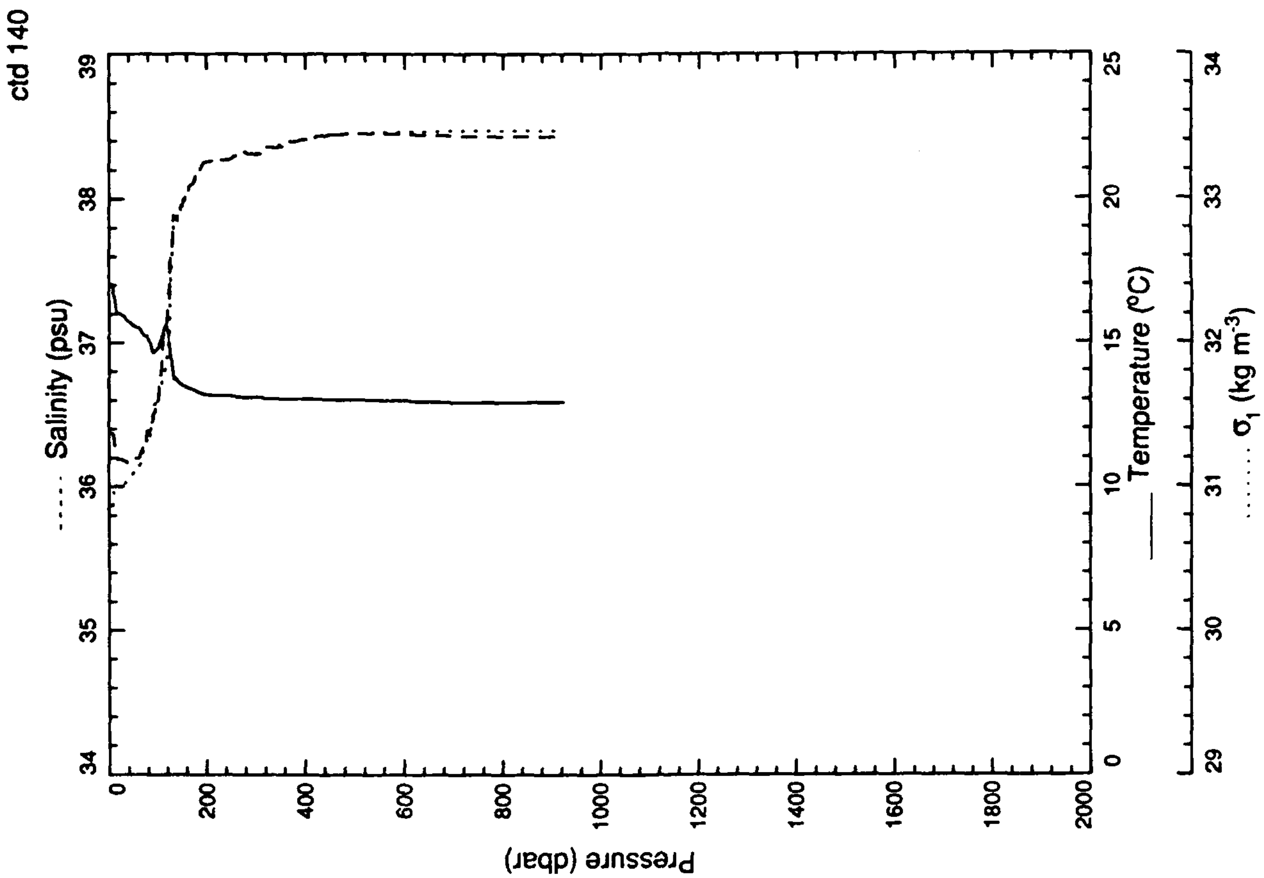

ctd 133
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)
34
35
36
37
38
39
0
5
10
15
20
25
29
30
31
32
33
34
0
200
400
600
800
1000
1200
1400
1600
1800
2000

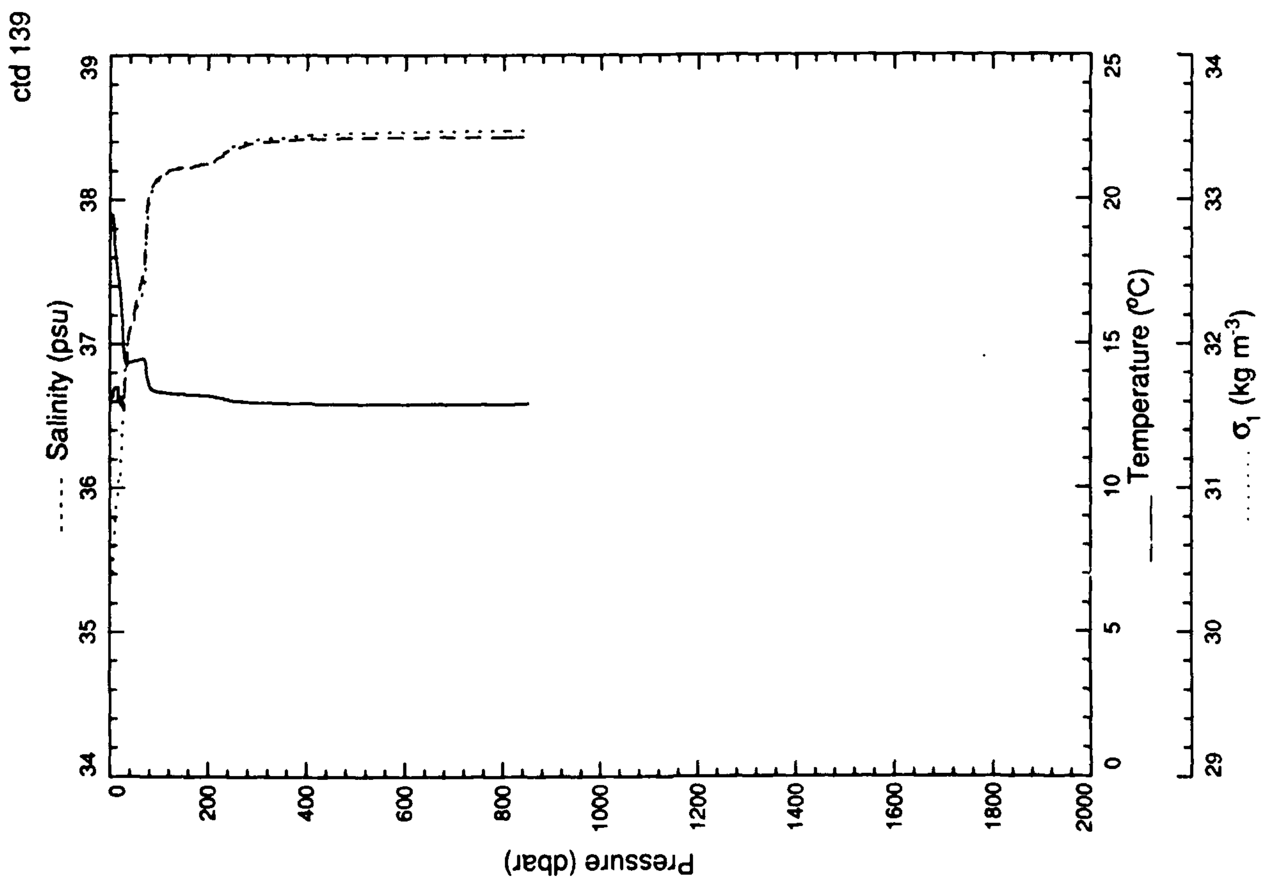

ctd 135
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

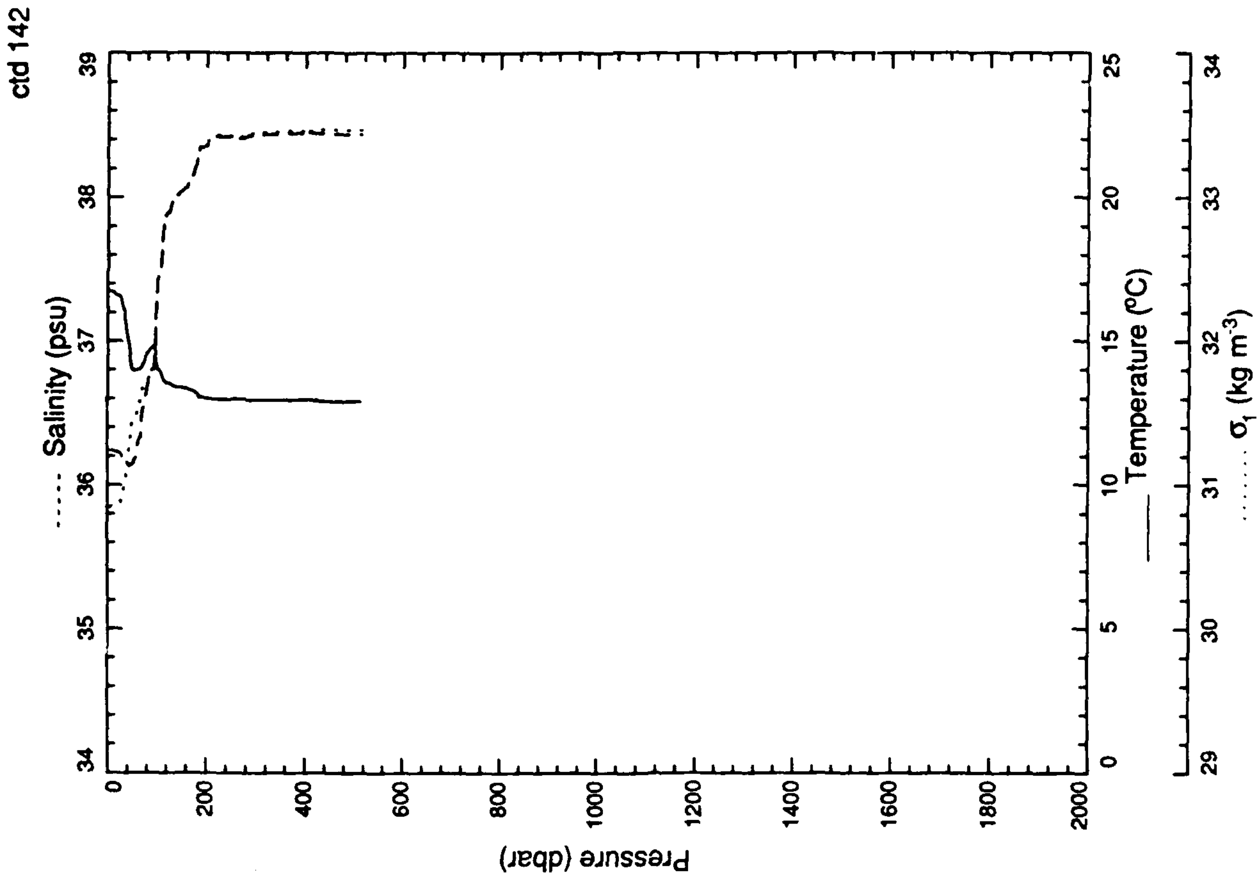

ctd 136
Salinity (psu)
34
35
36
37
38
39
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
0
5
10
15
20
25
Temperature (°C)
29
30
31
32
33
34
σ1 (kg m-3)

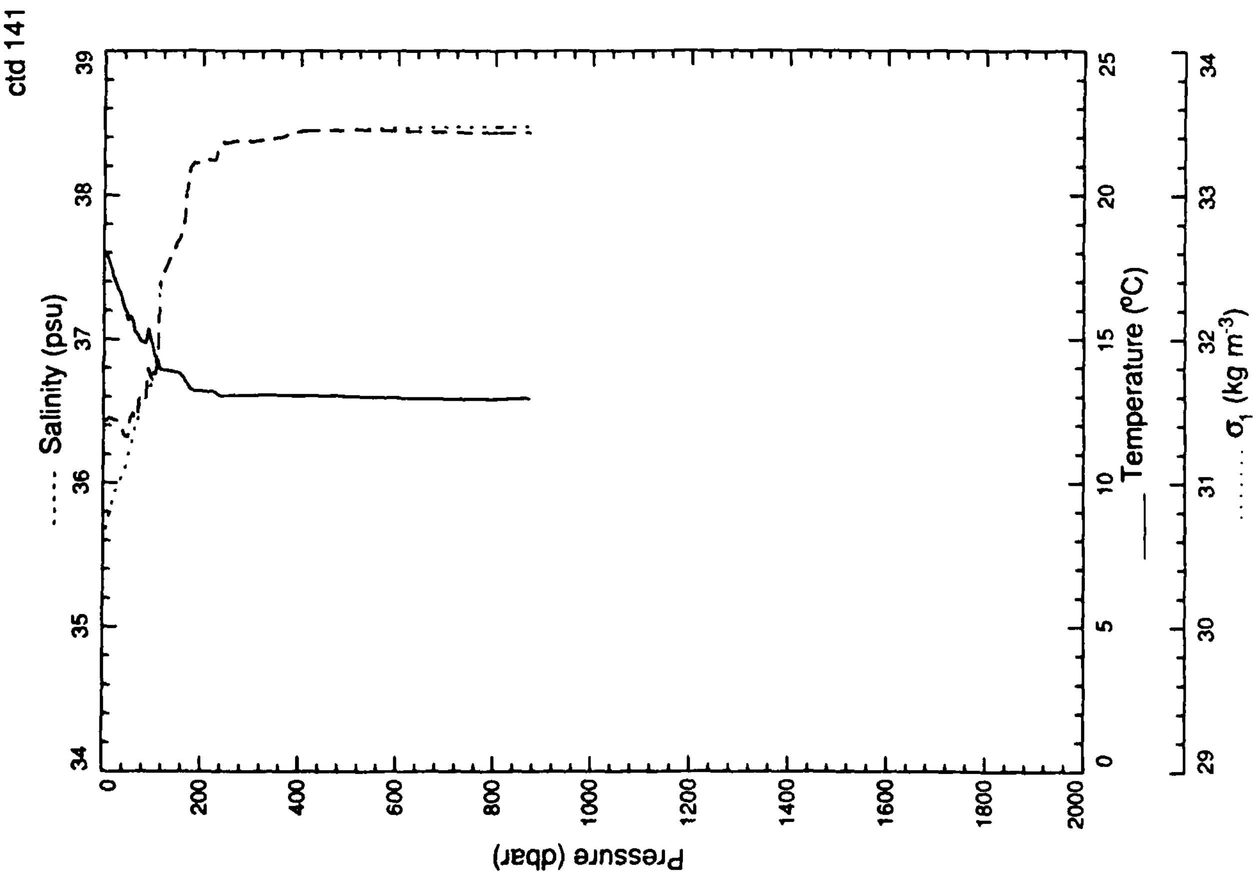

ctd 138
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000


ctd 137
Salinity (psu)
34 35 36 37 38 39
Temperature (ºC)
0 5 10 15 20 25
σ1 (kg m-3)
29 30 31 32 33 34
Pressure (dbar)
0 200 400 600 800 1000 1200 1400 1600 1800 2000

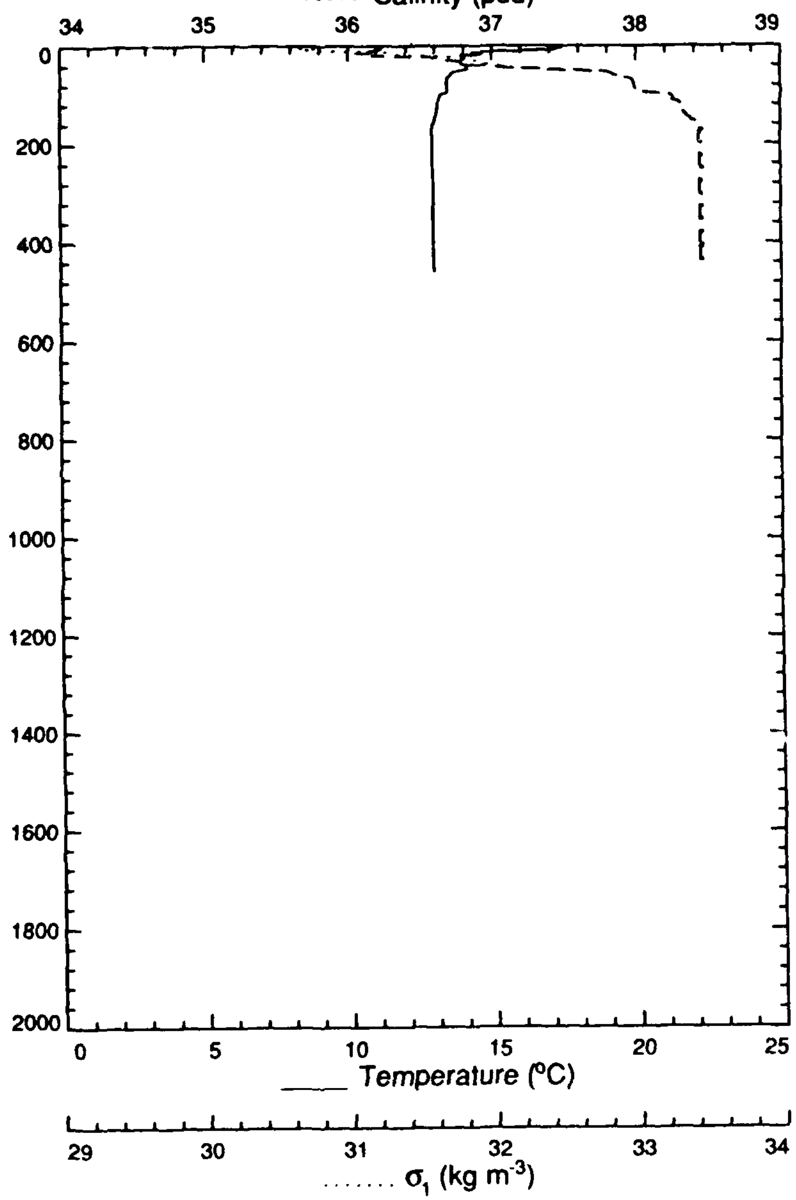

ctd 140
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)


ctd 139
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

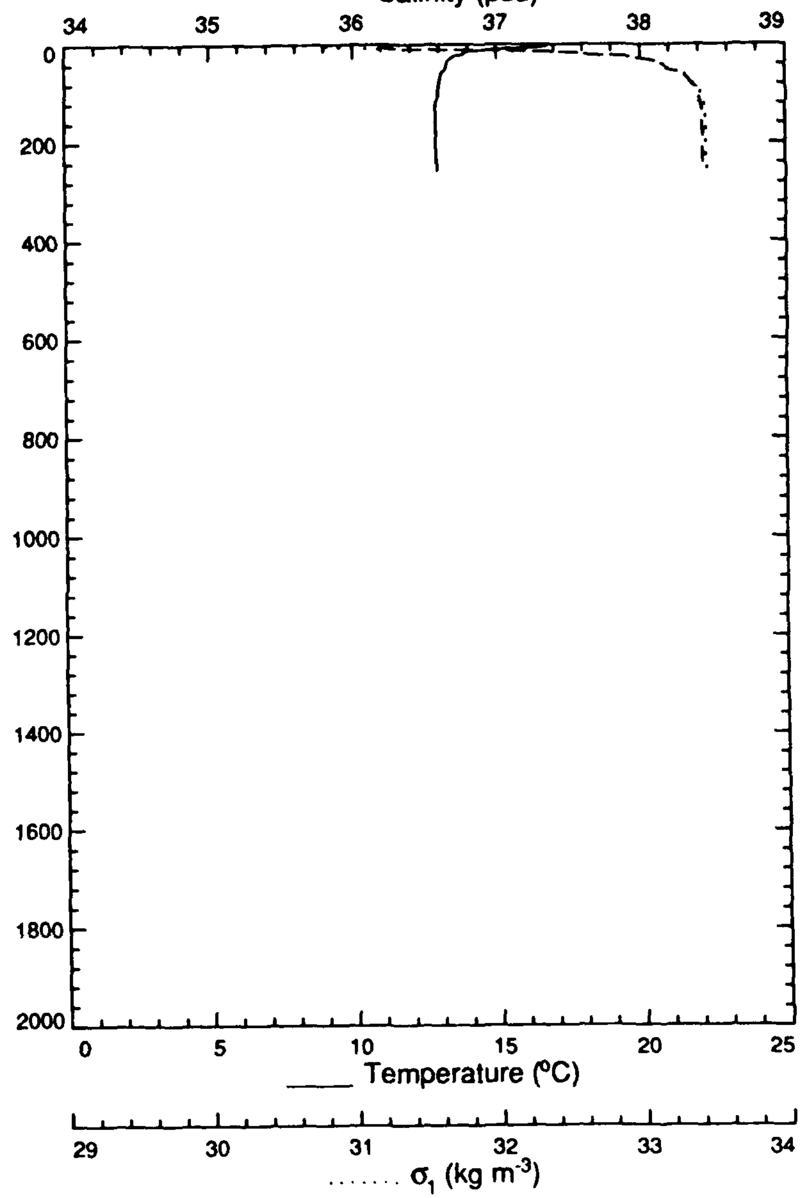

ctd 142
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

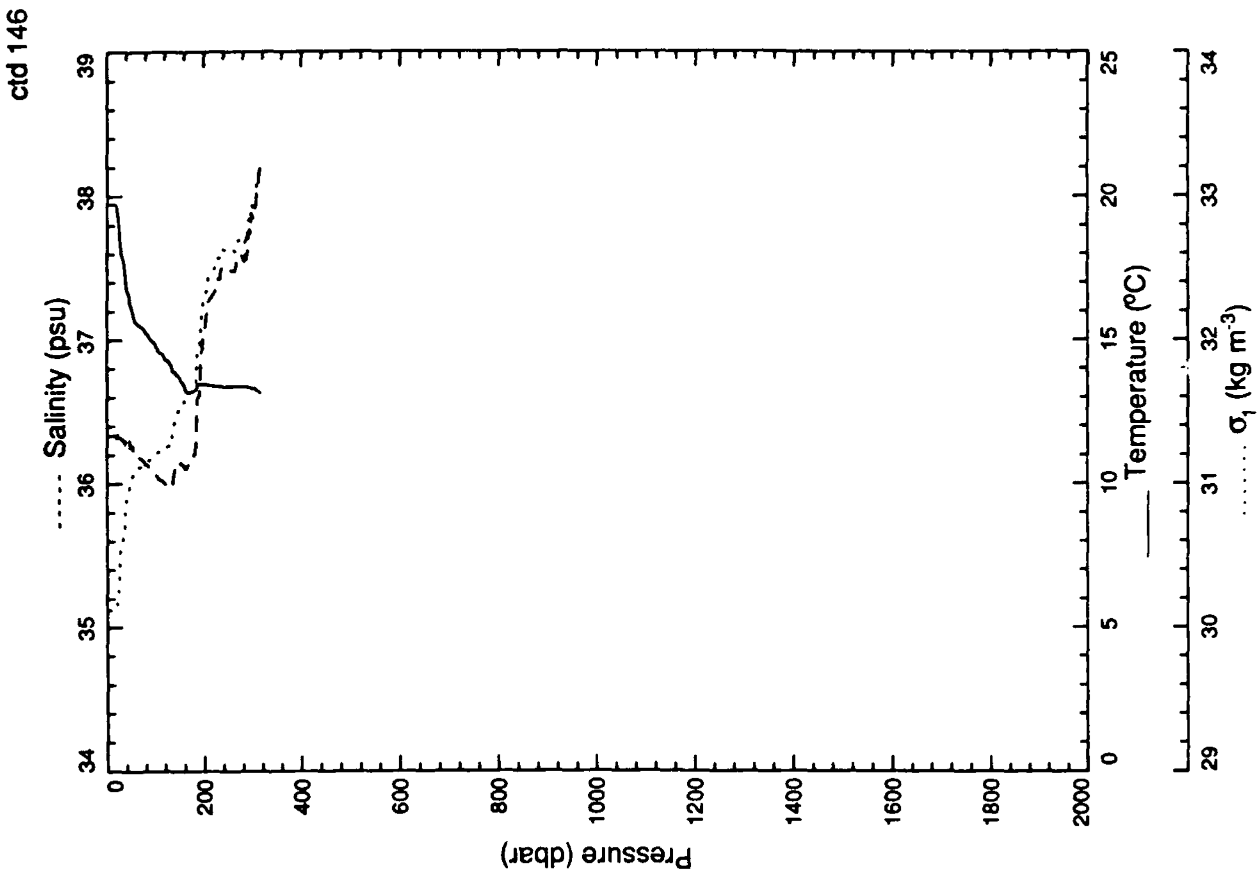

ctd 141
Salinity (psu)
Temperature (°C)
σ_1 (kg m^{-3})
Pressure (dbar)

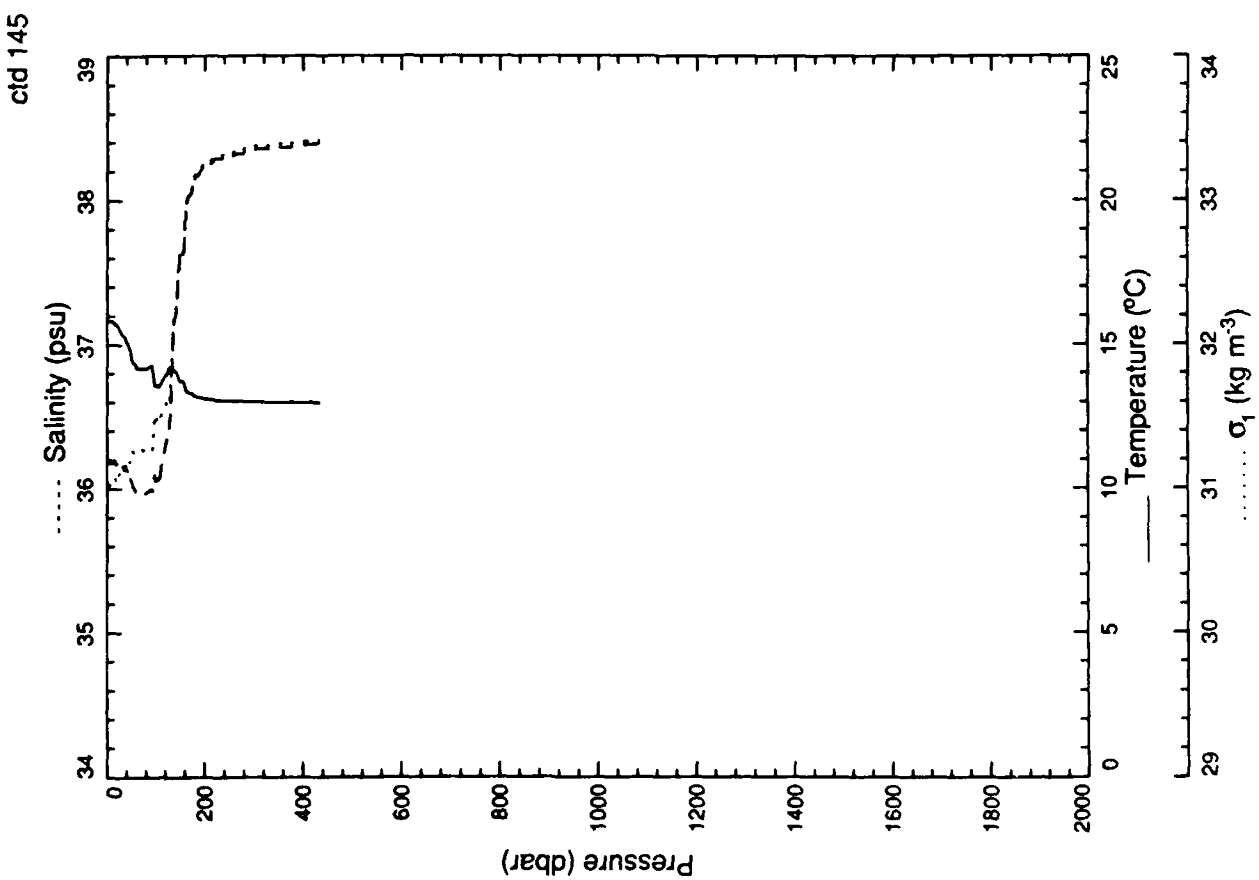
ctd 143

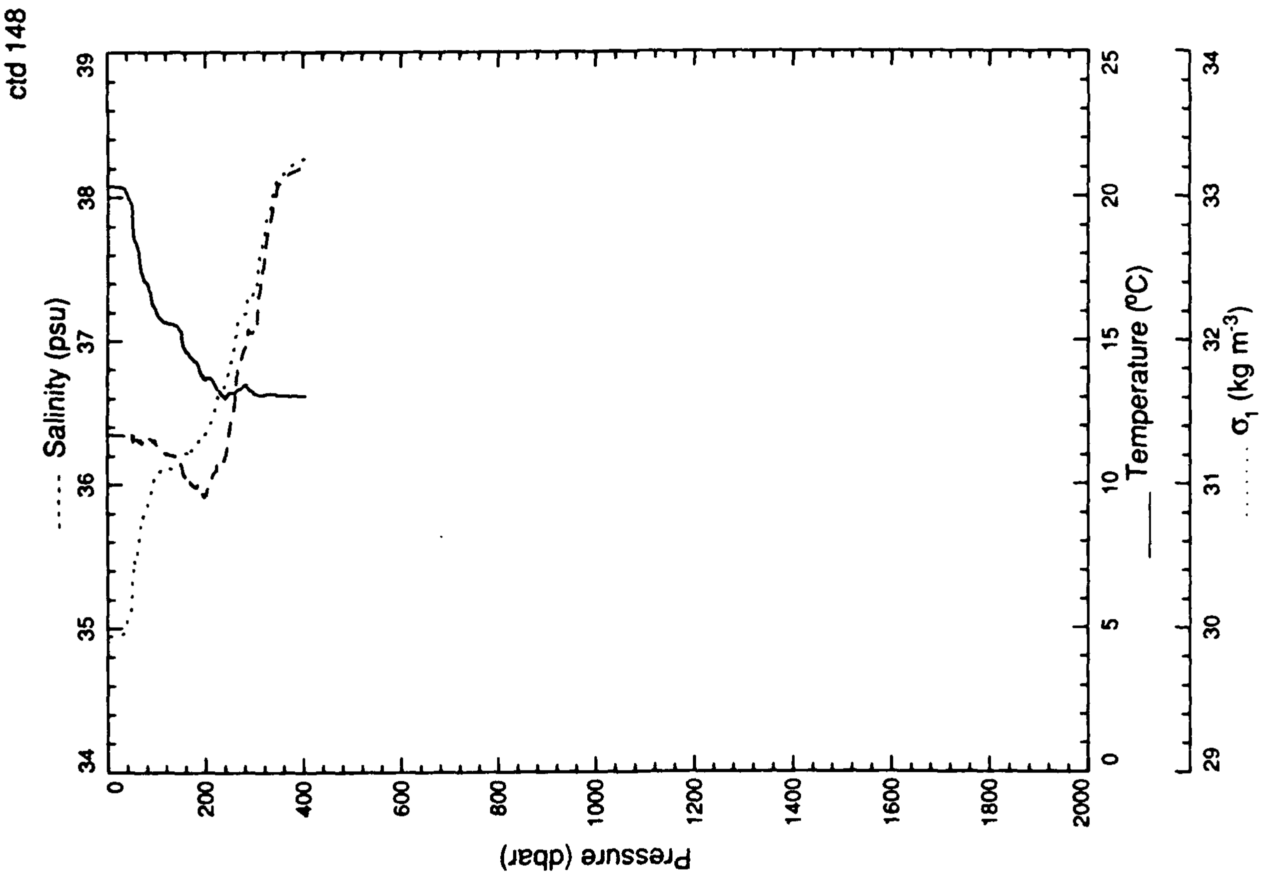


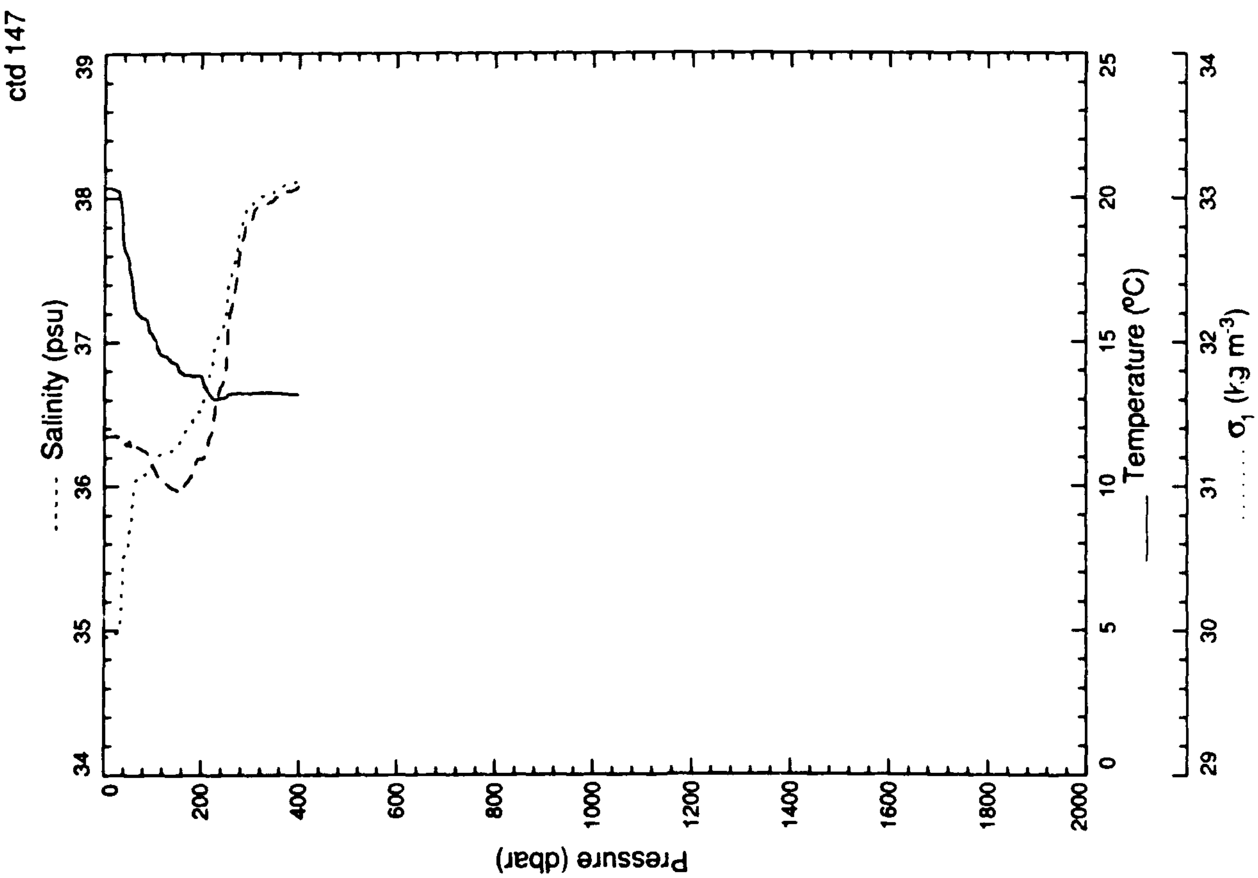
ctd 144




ctd 146
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)


ctd 145
Salinity (psu)
Temperature (ºC)
σ_1 (kg m^{-3})
Pressure (dbar)

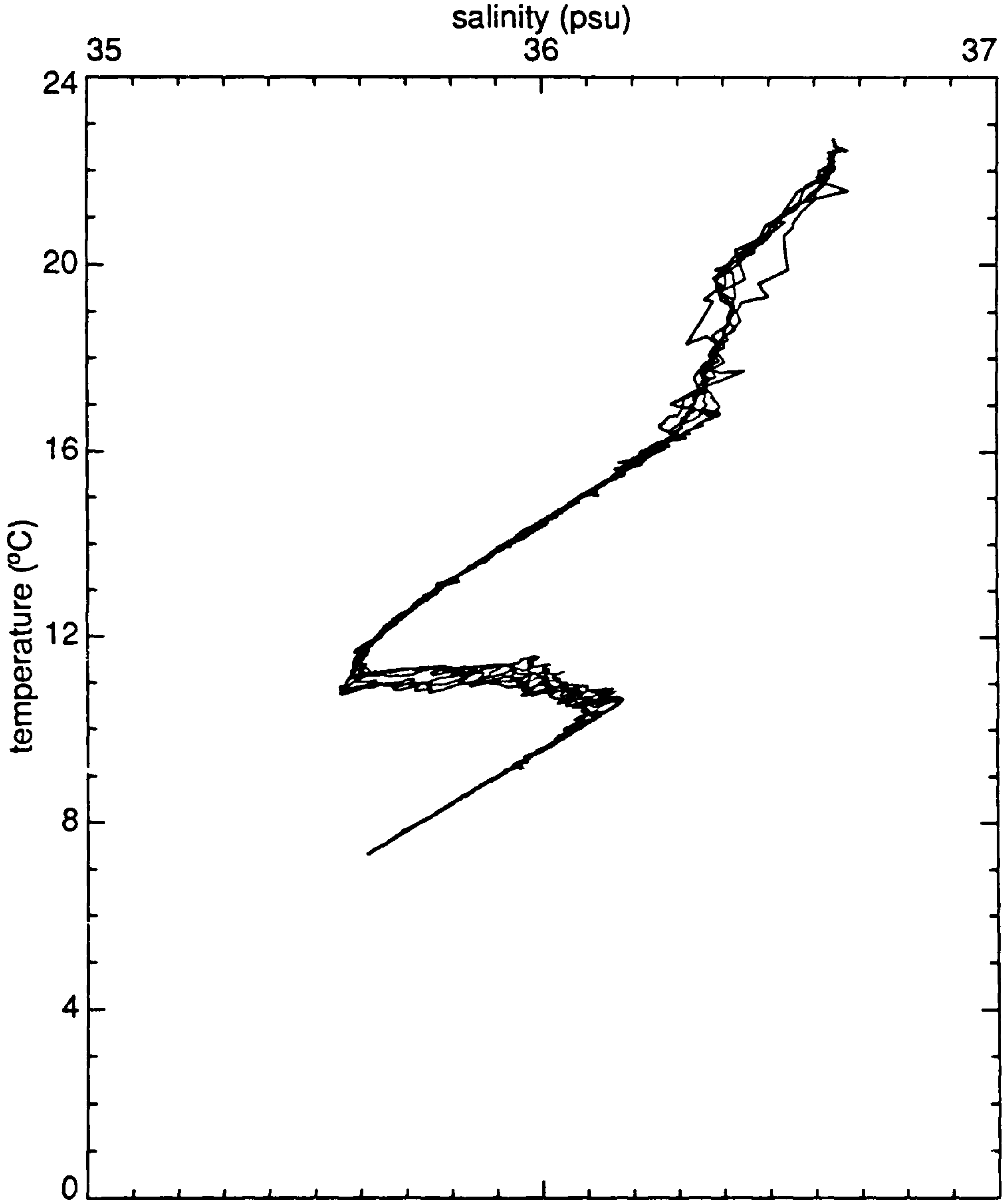

ctd 148
Salinity (psu)
34
35
36
37
38
39
Temperature (°C)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000


ctd 147
Salinity (psu)
34
35
36
37
38
39
Temperature (°C)
0
5
10
15
20
25
σ_1 (kg m^{-3})
29
30
31
32
33
34
Pressure (dbar)
0
200
400
600
800
1000
1200
1400
1600
1800
2000

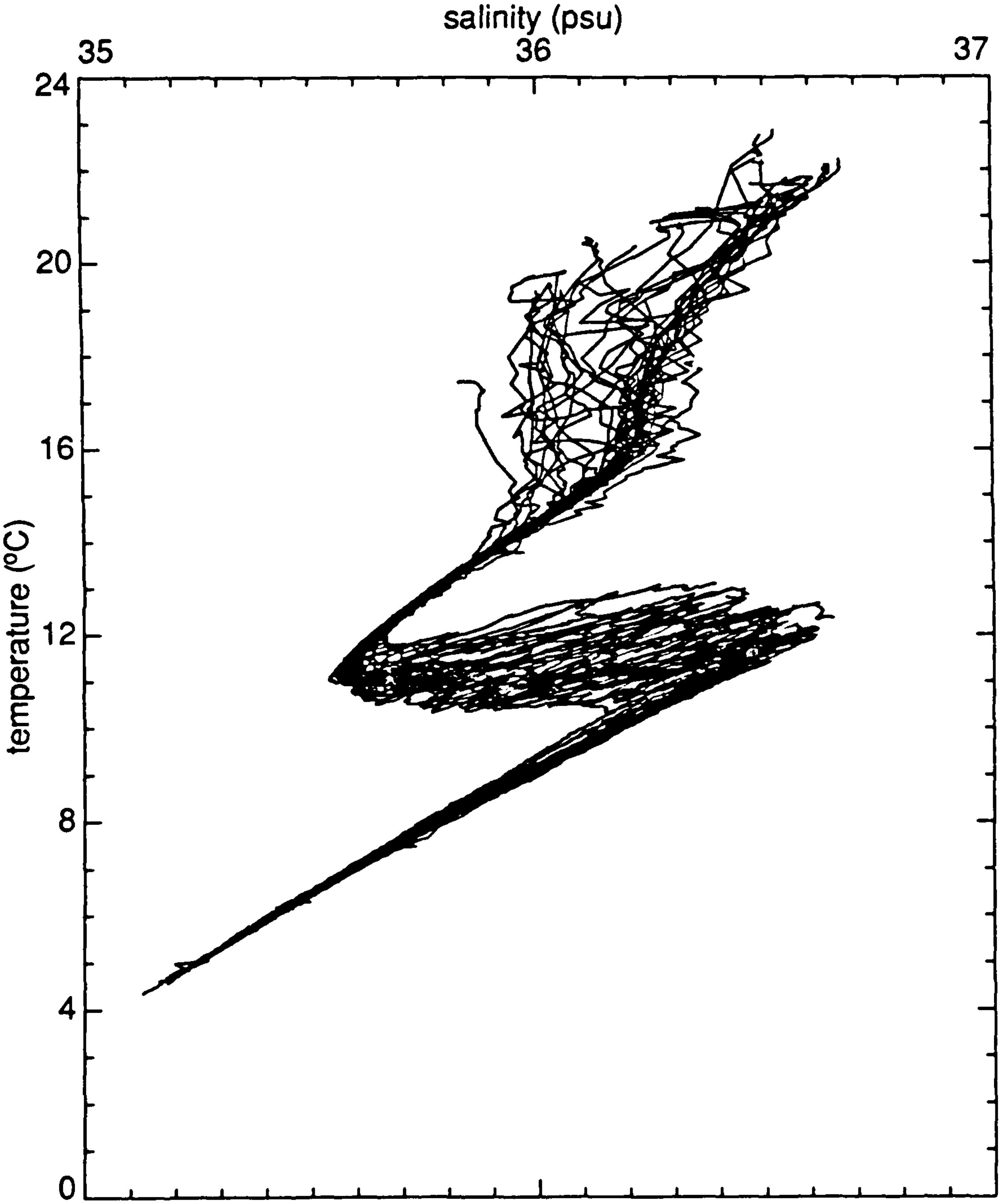
APPENDIX E

T/S Plots

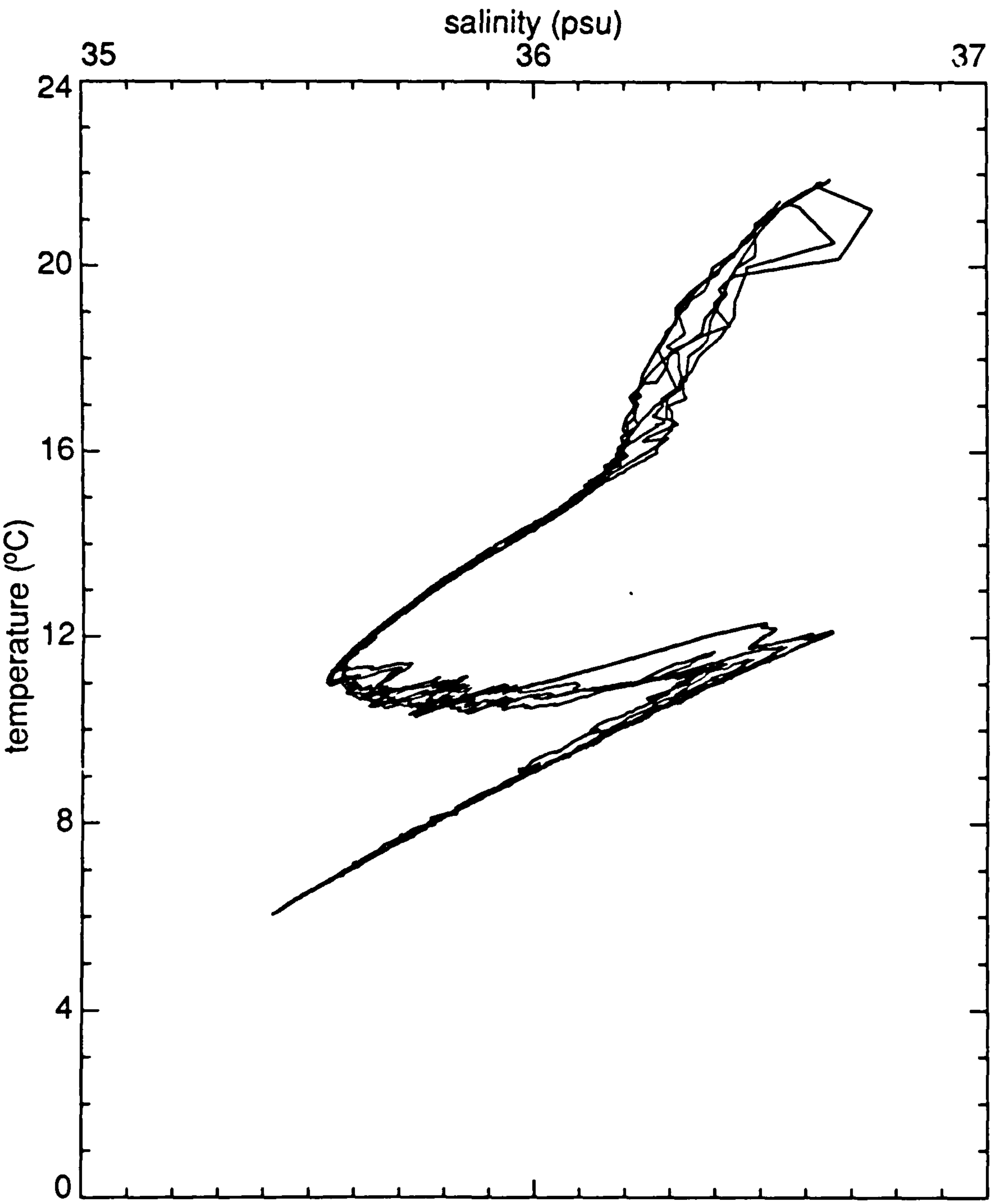
Ampere Seamount CTDs (002-007)



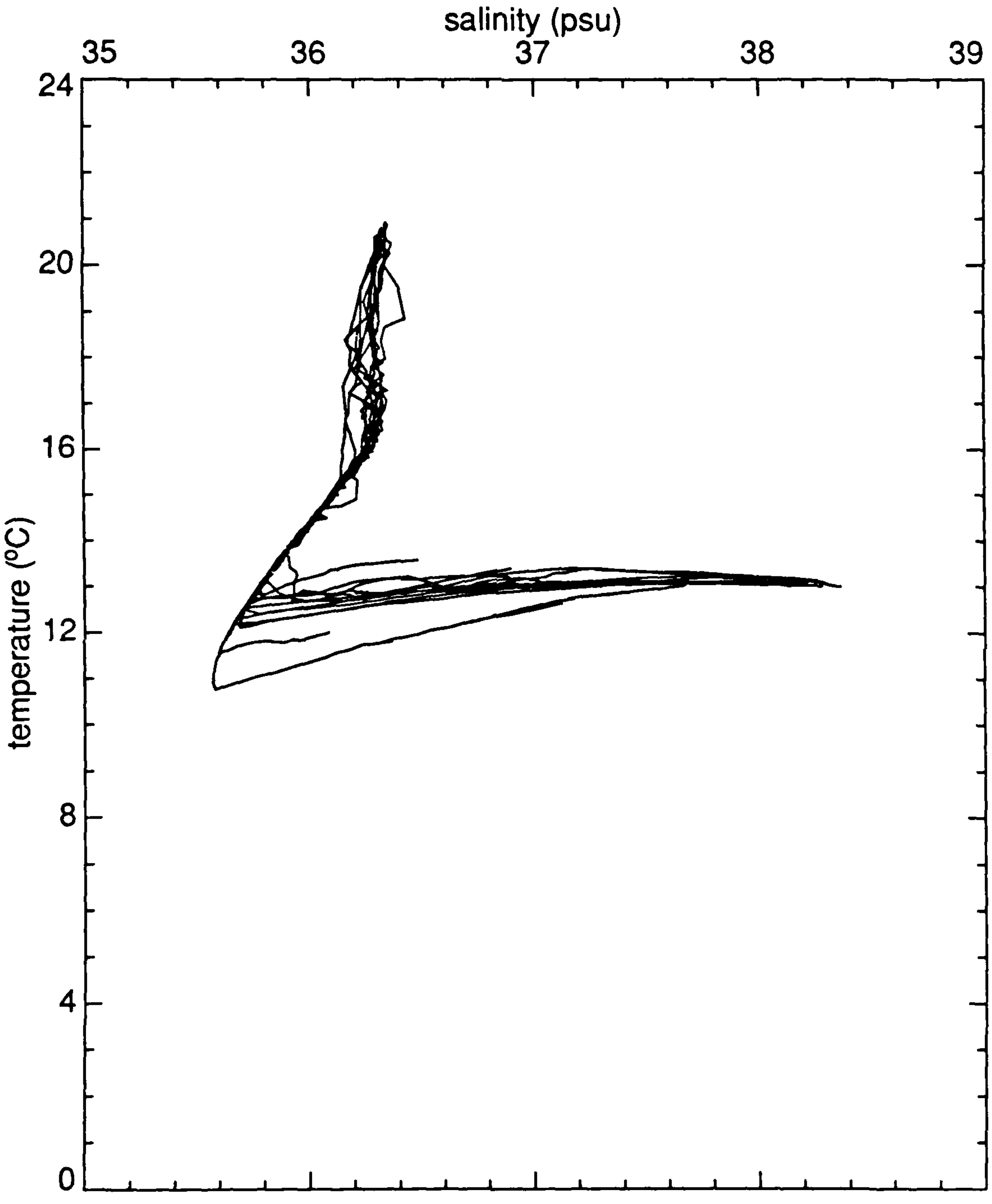
Meddy Component CTDs (008-041 and 049)



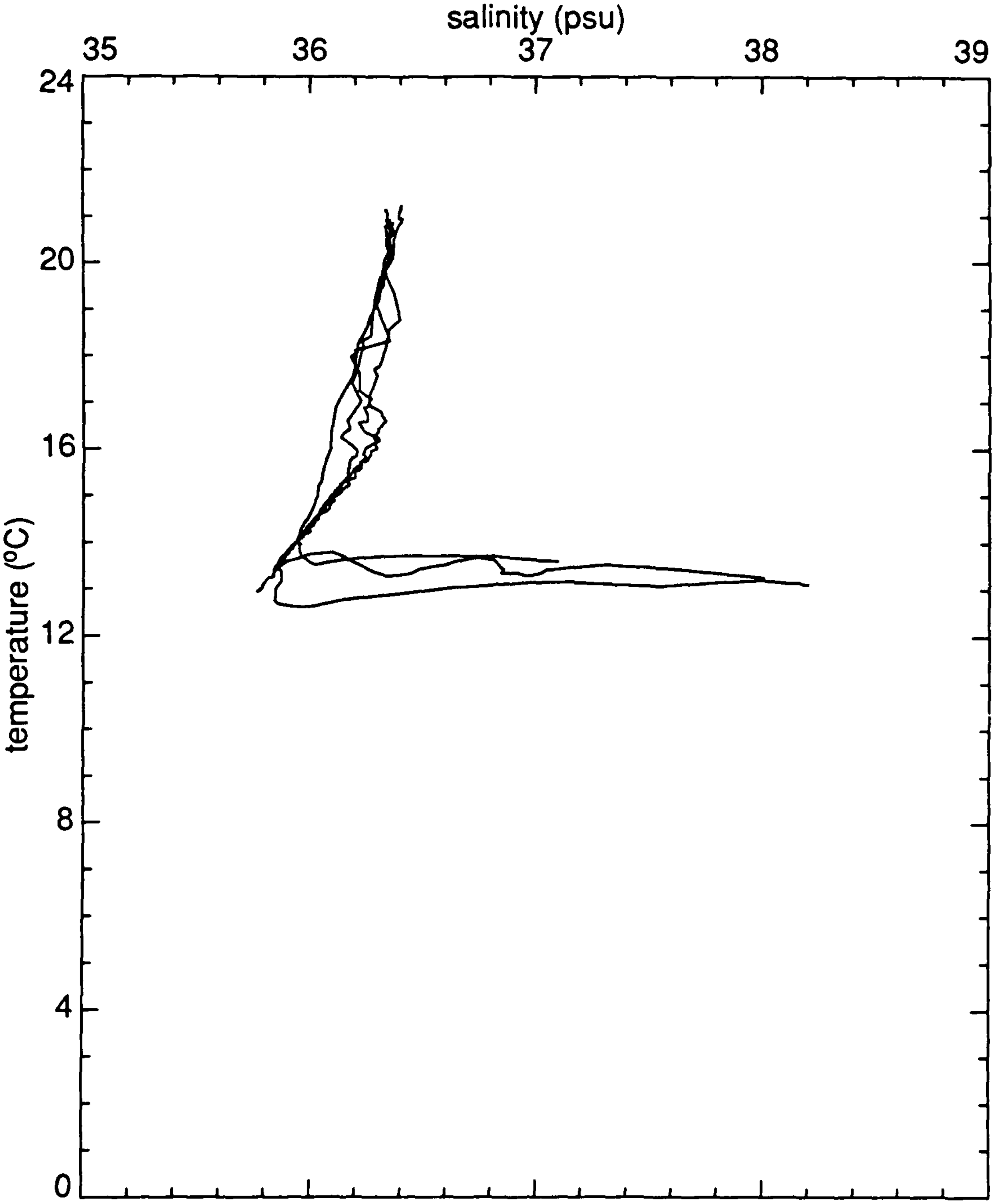
Meddy CTDs (042-048)



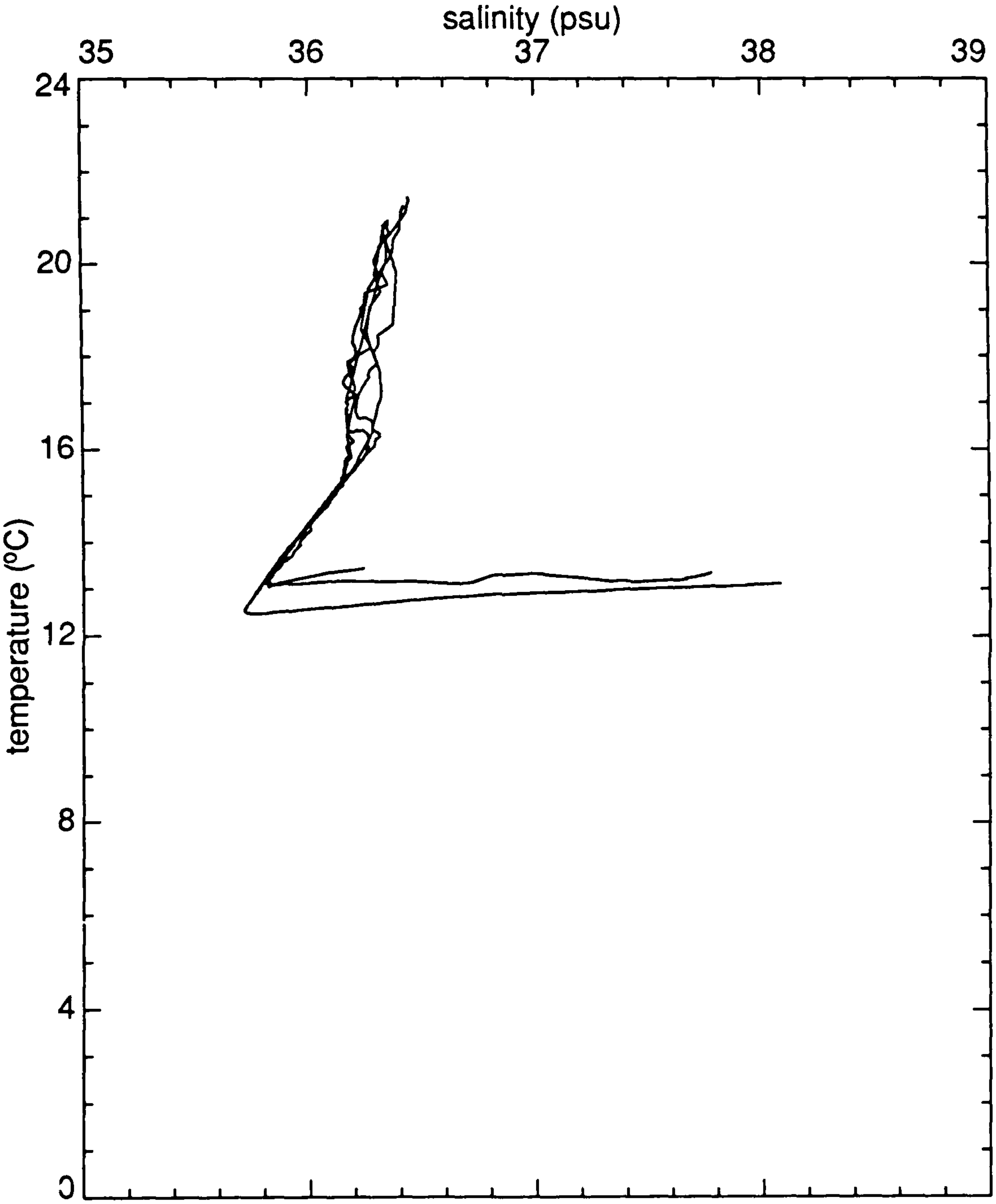
Site CTDs (050-062)



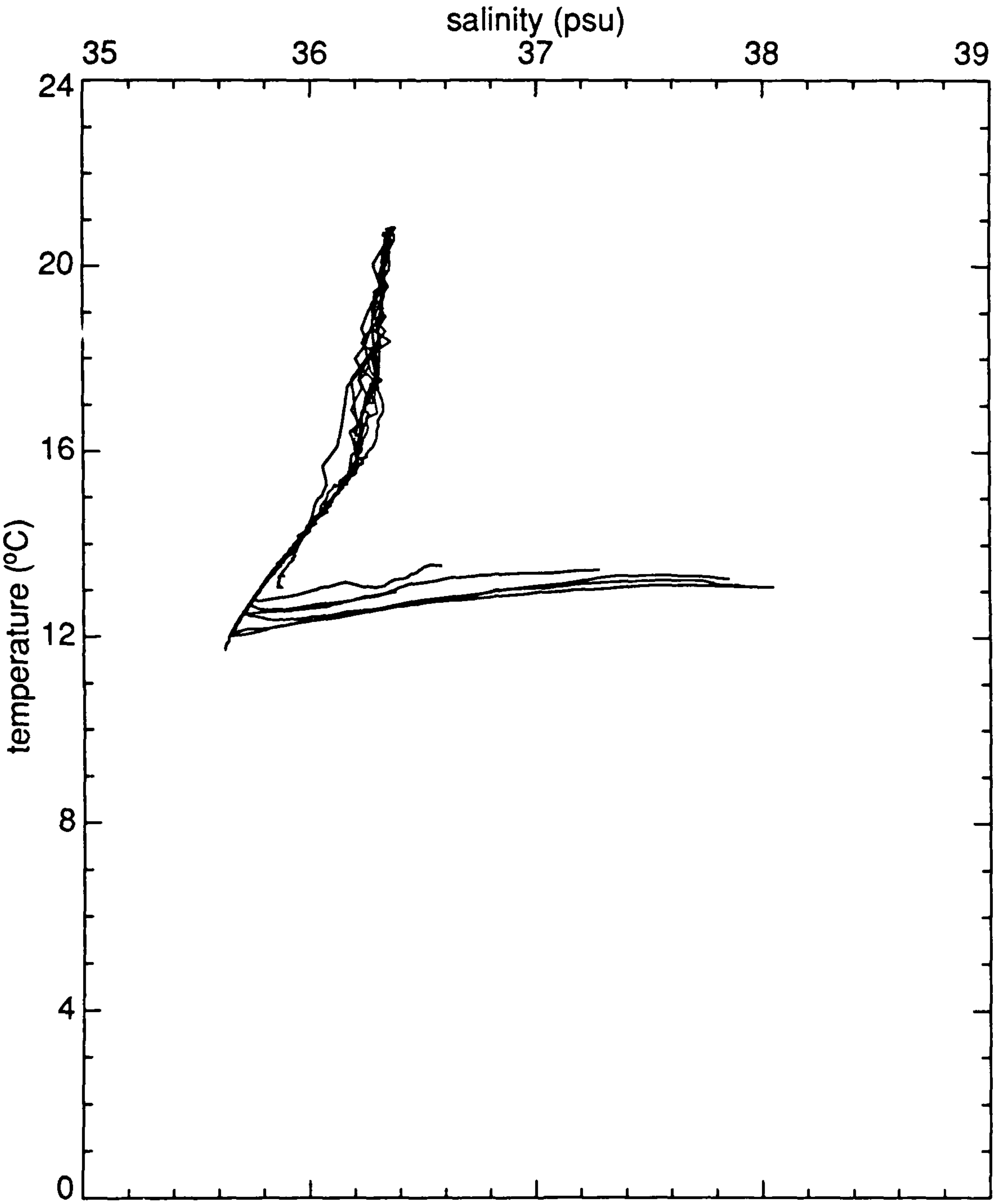
Section A CTDs (063-066)

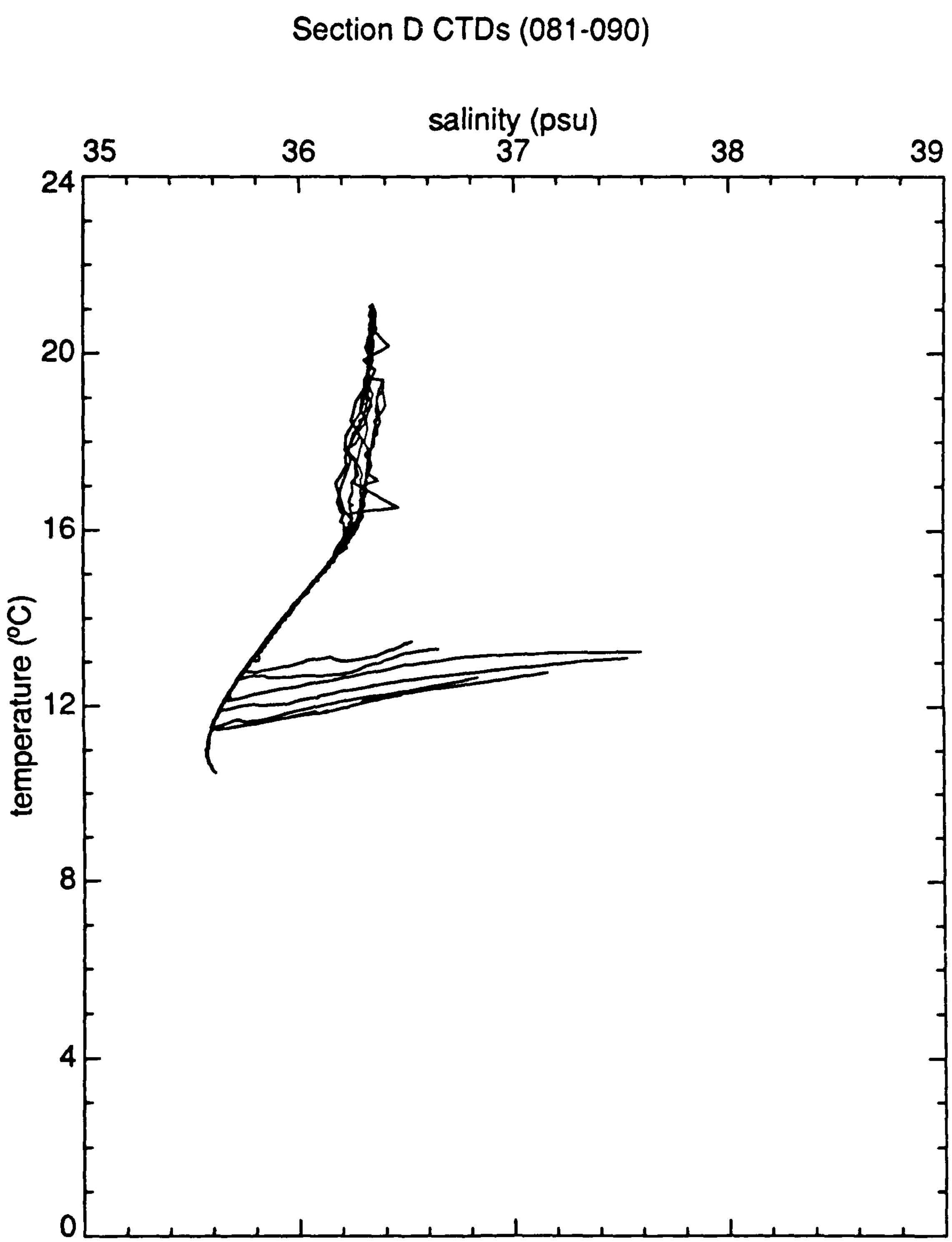


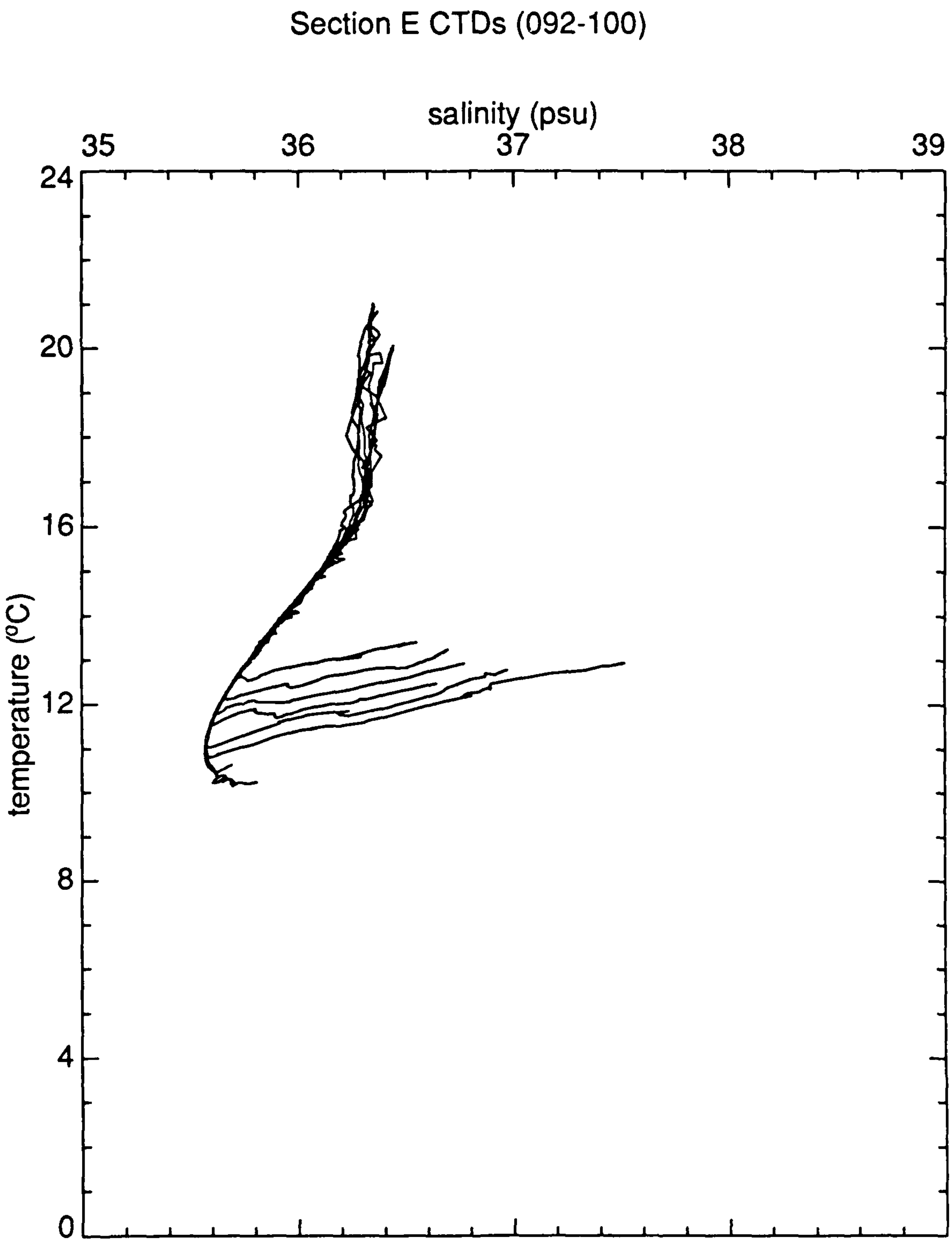
Section B CTDs (067-071)

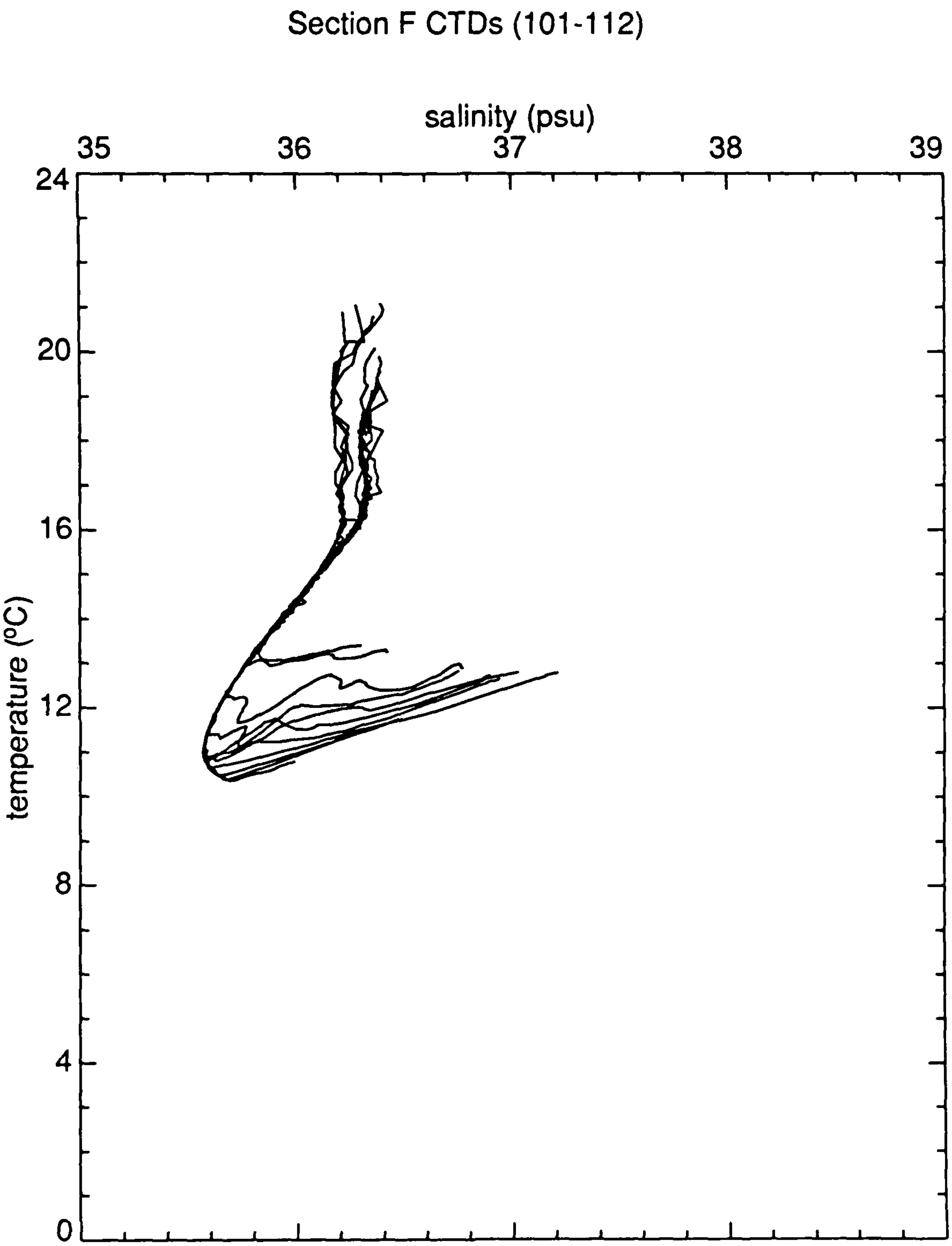


Section C CTDs (072-080 and 091)

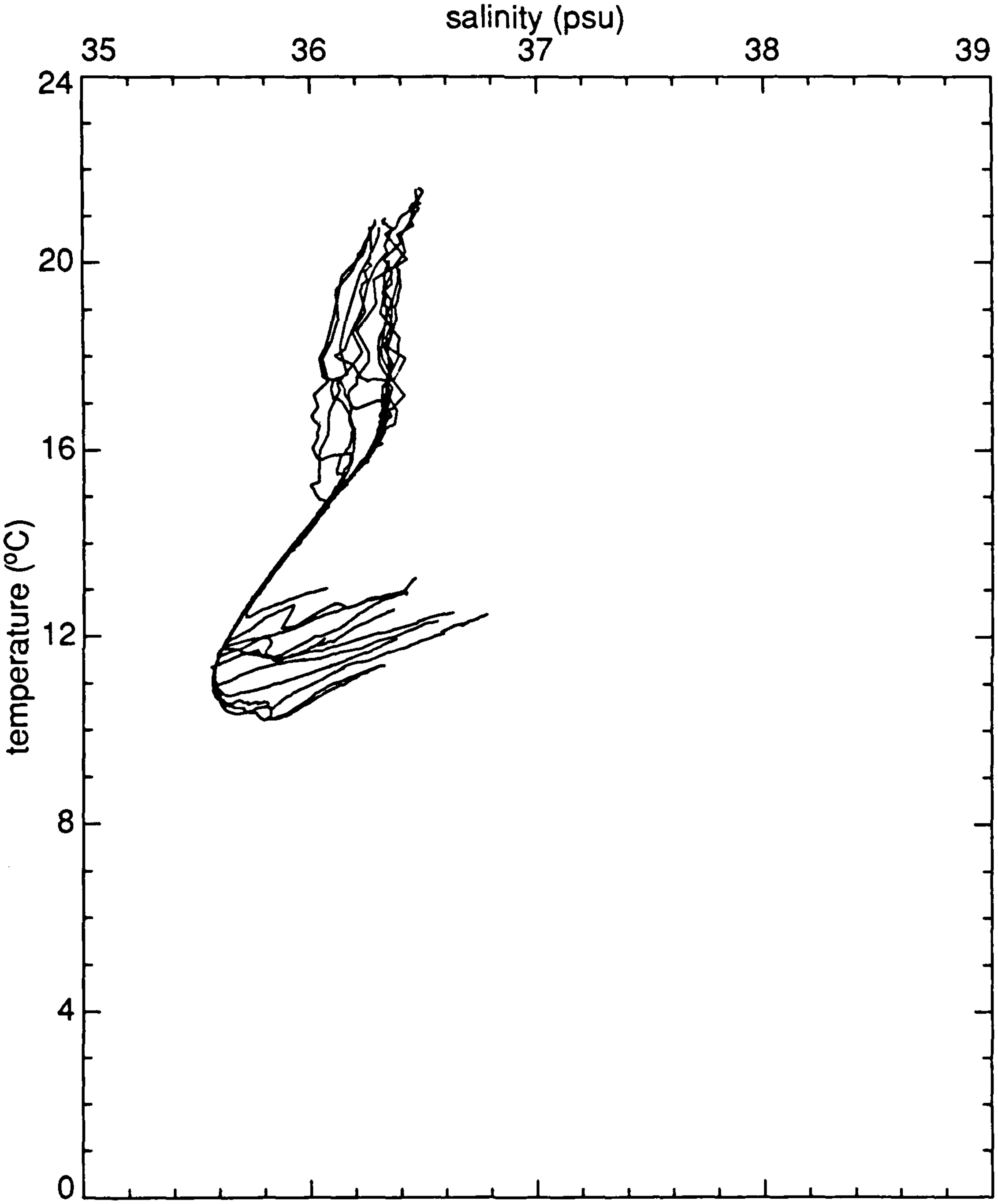



Section D CTDs (081-090)
salinity (psu)
35
36
37
38
39
24
20
16
12
8
4
0
temperature (ºC)

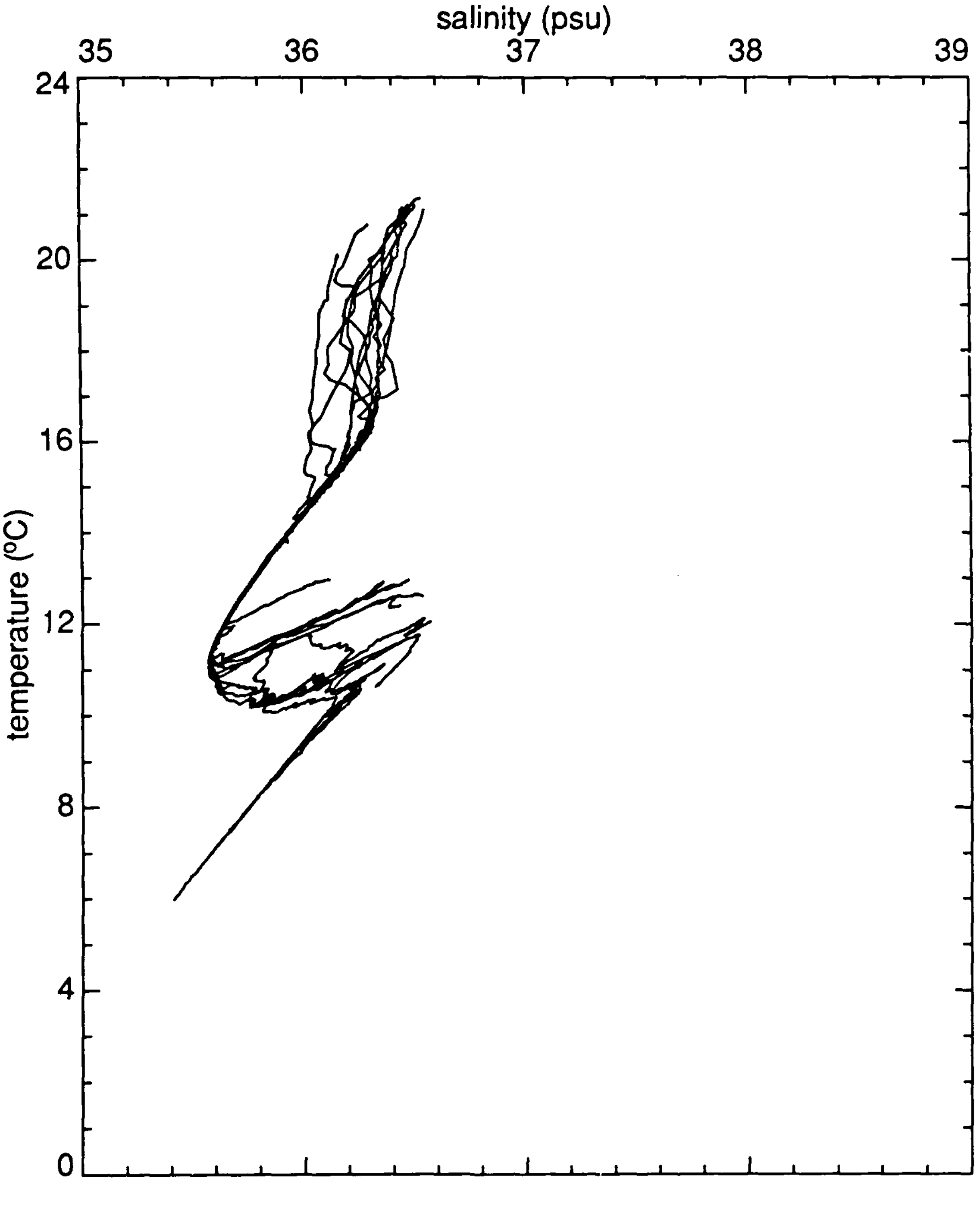

Section E CTDs (092-100)
salinity (psu)
35
36
37
38
39
24
20
16
12
8
4
0
temperature (ºC)


Section F CTDs (101-112)
salinity (psu)
35
36
37
38
39
24
20
16
12
8
4
0
temperature (ºC)

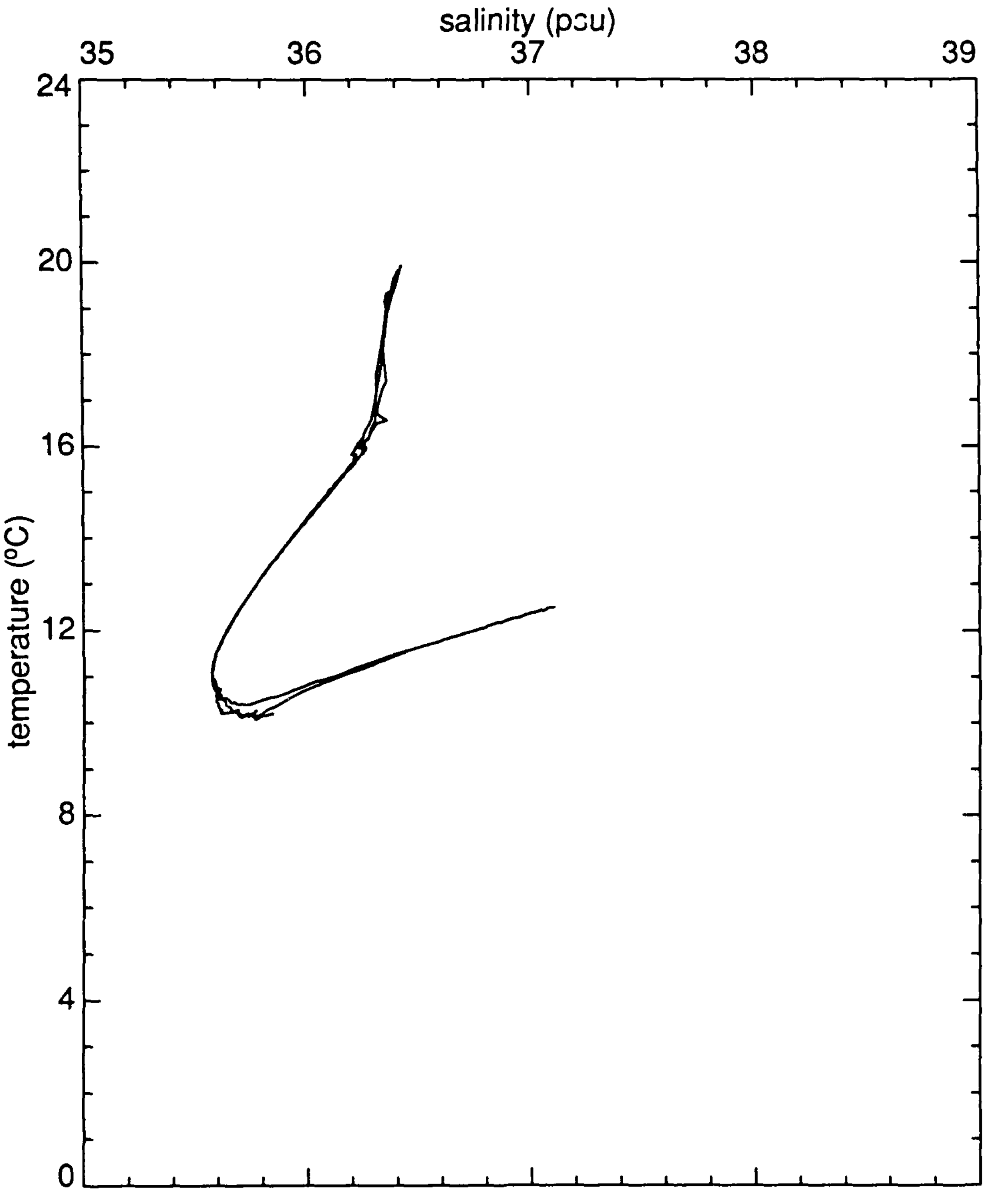
Section G CTDs (113-124)



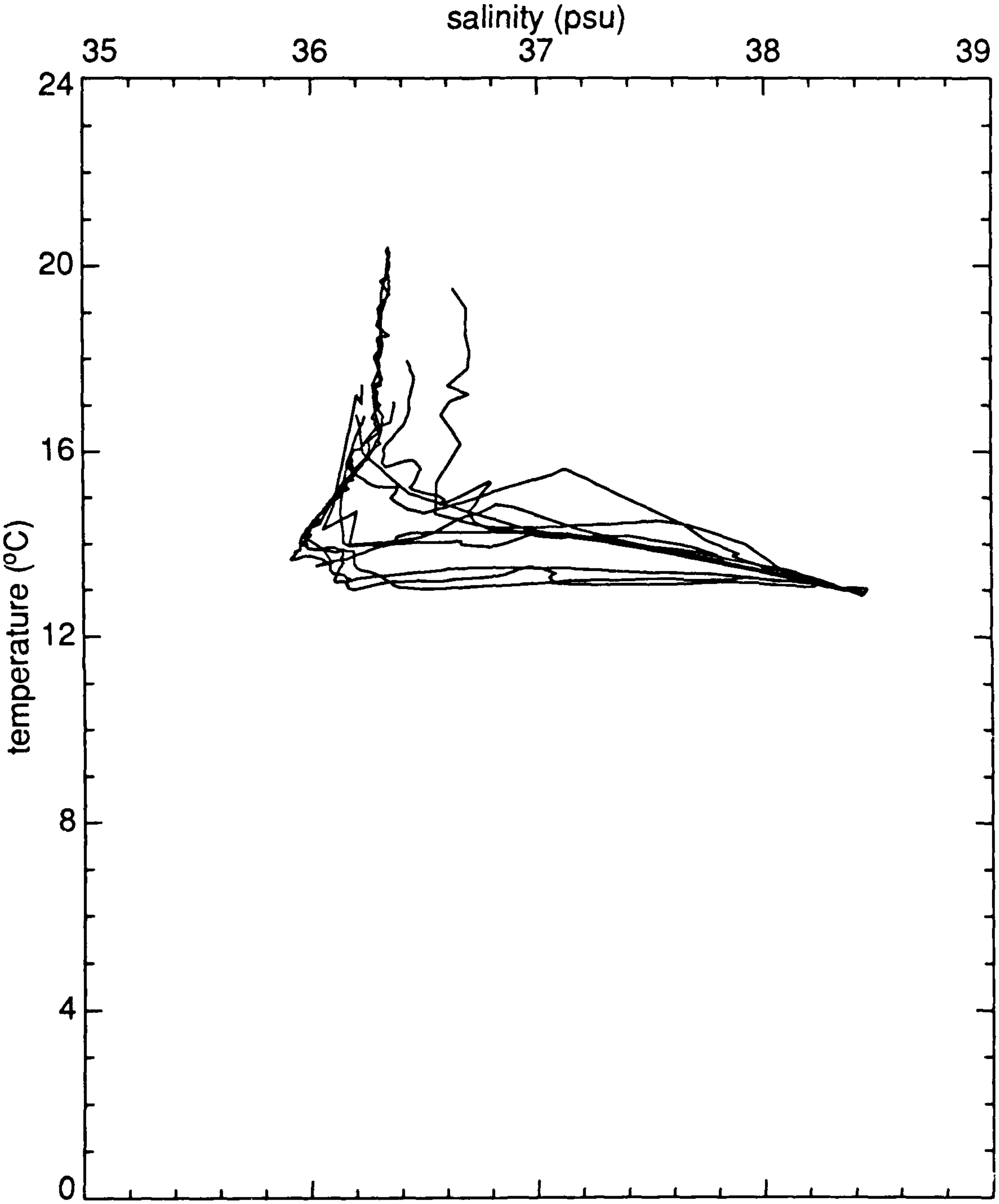
Section H CTDs (125-135)



Section FE CTDs (136-138)



Section I CTDs (139-148)



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12 PERSONAL AUTHOR(S)
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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

A total of 148 conductivity-temperature-depth (CTD) casts were made from R/V *Oceanus* during the Gulf of Cadiz Expedition, 4-28 September 1988. The regions studied included Ampere Seamount, the area around Cape St. Vincent, Portugal, and the Gulf of Cadiz west of the Strait of Gibraltar. This report describes the instrumentation used, discusses data acquisition and processing methods, and presents the processed CTD data.

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